THE
ELECTRICAL REVIEW.

VOL. LXVII. OCTOBER 21, 1910. No. 1,717.

ELECTRICAL REVIEW.

Vol. LXVII.] CONTENTS: October 21, 1910. [No. 1,717.

	Page
Trying their Strength	645
Trade and Credit	646
Telephone Troubles	646
Osram Lamps	647
Alarm-Signalling Devices for Circuit-Breakers (*illus.*)	647
Correspondence :—	
The Association of Mining Electrical Engineers	649
Tests on Bitumen Cables	649
Municipal Trading	650
Balance System of Protection for Transformers	650
New Electrical Devices, Fittings and Plant (*illus.*)	650
Legal	655
Proceedings of Institutions :—	
The Association of Mining Electrical Engineers	657
The Book-keeping and Accounts of Telephone Undertakings	658
Business Notes	659
New Plant of the Northampton Polytechnic Institute (*illus.*)	665
"Stevens" Petrol-Electric Vehicles for India (*illus.*)	667
The Igranic Theatre Dimmer (*illus.*)	668
Notes	672
City Notes	675
Electric Tramway and Railway Traffic Returns	676
Stocks and Shares	676
Share List of Electrical Companies	677
The Inexactitudes of Oil Testing	679
Liability of Electrical Contractors for Accidents in Mines	680
Reviews	681
Evening Classes	683
Queries ? ? ?	685
Trade Statistics of Jamaica	685
A Broadway Electric Sign (*illus.*)	686
The Cost of Arbitration Proceedings	686
Thury's Electric Clock (*illus.*)	687
Foreign and Colonial Tariffs on Electrical Goods	688
New Patents Applied For, 1910	688
Abstracts of Published Specifications	688
Contractors' Column	Advertisement pages xxii and xxiv

THE ELECTRICAL REVIEW.

Published every FRIDAY, Price 4d.

The Oldest Weekly Electrical Paper. *Established 1872.*

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE:—4, LUDGATE HILL, LONDON, E.C.

Telegraphic Address: "AGEKKAY, LONDON." Code, A B C.

Telephone Nos.: Holborn 933; Central 4425 (Editorial only).

ALL Letters should be addressed to the Proprietors, H. Alabaster, Gatehouse & Co.

ADVERTISEMENT RATES ON APPLICATION.

The "Electrical Review" is the recognised medium of the Electrical Trades, and has

BY FAR THE LARGEST CIRCULATION

of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES.—Per annum, postage inclusive, in Great Britain, 19s. 6d.; Canada, £1 1s. 8d. ($5.30). To all other countries, £1 10s.

BINDING.—Subscribers' numbers bound, including case, for 4s. each volume.

CASES.—Cloth Cases for Binding can be had, price 2s. 6d. each; post free 2s. 9d.

FOREIGN AGENTS.—New York: D. VAN NOSTRAND, 23, Murray Street. TORONTO, ONT.: WM. DAWSON & SONS, LTD., Manning Chambers. Paris: BOUTRAU & CHEVILLET, 22, Rue de la Banque. Berlin: ASHER & Co., Unter den Linden.

Cheques and Postal Orders (on Chief Office, London) to be made payable to Mr. H. ALABASTER, 4, Ludgate Hill, E.C.

THE

UNIVERSAL ELECTRICAL DIRECTORY

(J. A. BERLY'S).

1910 EDITION

H. ALABASTER, GATEHOUSE & CO.,

4, Ludgate Hill, London E.C.

TRYING THEIR STRENGTH.

THE two electrical organisations which are supposed to represent respectively the municipal electricity supply systems and the electrical wiring and installation contractors of the United Kingdom are making elaborate preparations for the enrichment of the legal profession.

The municipal authorities have assumed the offensive, and the contractors naturally feel that they have no alternative but to take steps for as effective a defence as they can possibly set up. The organisation representing the borough electrical engineers has determined to get the better of the contractors, and so it has been going, cap in hand, to hundreds of municipal authorities, begging financial and other support in its efforts to promote its Bill for extende powers. Some places—acting, we presume, chiefly on their "technical" adviser's advice—have willingly agreed, because it admirably fits in with the predominant feeling in the Council in favour of municipalisation. Others have agreed to give moral support, but their enthusiasm is so great that never a penny will they spare. Yet others have debated the matter in public, and on these occasions there have not been wanting plainly worded protests against municipal competition with a town's own ratepayers. However, money is being got together for the promotion of this Bill—the ratepayers' representatives are voting ratepayers' money to carry a Bill which may give authority to compete with ratepaying private traders, whatever else it proposes to do.

Exactly how much has been subscribed to this guarantee fund we do not know, but we are aware that this action of the municipalities has compelled the Electrical Contractors' Association representatives also to go round, cap in hand, securing promises for their fighting fund, and so we are preparing a second amount for the benefit of the lawyers. We understand that Mr. Leonard Tate, the agile secretary, and Mr. J. Harland Bowden, the spirited president of the Association, have just returned from a visit among their members in the north of England and in Scotland, as a result of which tour they have secured promises for £1,000, though only one-third of their members have yet been tapped.

The sums guaranteed to either party in the contest may not be large, but even if they were less such expenditure would be deplorable. It is little short of rank folly that the electrical industry should be engaged in squandering its resources and wasting its energies in a contest of this kind. Talk of co-operation! Talk of common electrical interests! Here, indeed, is an illustration.

Every week an item or two comes through into our news section regarding consideration given to the question in different towns. It is as well to remember that a proposal brought forward by the municipal official or department has a good start before it is discussed in

the Council chamber, and unless the arguments on the other side can be driven home by the contracting interests, it is not unnatural that the official recommendation should be accepted with little ado. The opposition has occasionally shown itself through the local Chambers of Commerce, some of the members of which are Councillors. The support in some places has been very grudgingly given, the application being supported by only a small majority; and if ever the matter comes before a Parliamentary Committee this point will be made quite plain. This week fresh news reaches us from Dundee, which has been the centre of a contest on the point in recent months. Here, after very full deliberations, and listening to several discussions, the proposal to apply for wiring powers has been disapproved, only that for motor-hiring receiving sanction. Other towns are finding a way out by appointing specially authorised contractors, and giving them inducements to make an effective effort. There are certainly plenty of reasonable ways to be found out of the difficulty without proceeding headlong to a Parliamentary contest which will probably do little lasting good to anybody.

TRADE AND CREDIT.

The question of credit in connection with foreign trade transactions is undoubtedly becoming a more serious one. It is conceivable that small firms with limited resources may find themselves altogether debarred from carrying on business relations with certain markets, or with particular firms in those markets, because they cannot stand the burden of long and uncertain accounts. This is no light matter when dealing direct through one's own foreign offices or through specially selected agents who know, as far as it is possible to ascertain it through the ordinary local channels, the financial standing of new customers; but the risks are, of course, greater still when one deals direct through the post with unknown firms. Even the stipulation for remittance with first order, which may be objectionable from the point of view of a sound buyer, may be valueless as a safeguard against a slim client who sends his first order and remittance as a sprat to catch a mackerel ere many weeks have passed. Yet the refusal to supply small consignments without suitable references or ready cash payment is a procedure which a wise firm varies if it can ascertain in any way, from quite other sources of information, whether the name, standing and resources are satisfactory.

As a rule, between the receipt and the completion of an order, there is no time to get into touch with the British Consular officials unless through the comparatively costly medium of a reply-paid cablegram, and if there were, these representatives naturally enough cannot go far in the information they impart except in cases where notorious "sharks" are the "clients" in prospect. They, however, make a practice of helping home firms to secure local agents of standing and knowledge, if desired to do so. Sometimes it is possible to ascertain something about local traders' doings from a study of a few years' directories—these, at any rate, should tell you whether a firm in question has been in actual existence over a period of any length. We have in mind an occasion on which an electrical firm refused credit to a foreign house and lost business as a consequence. In this particular case the news columns of the Electrical Review had contained information which, had it been closely studied when it appeared, or if it had been filed in easy reference form, should have shown that the operations of the firm in question were of a fairly wide character, making the case one in which the risks were not unreasonable. There are firms who, for years past, have made a weekly search through our pages from cover to cover, cutting out everything that is likely to be of the least service to them in their concerns. This is one of our objects in publishing such information. The more we are cut up the better we like it, though we confess that occasionally we have been moved to merriment when calling upon some of our friends to find that they have made such good use of us that they have not a complete copy to refer to! There are more services rendered to the electrical trade by the weekly records than some men dream of. But we are guilty of a digression here, though it is only a digression which naturally brings us back to the main point of these observations. When the demand for credit, and longer credit, is increasing because of the disposition of other manufacturing countries to win the favours of the buyer by this very acceptable means, exporting firms cannot afford to neglect any available source of information for guiding them in their business relations. Generally speaking, business firms recognise the ordinary rule of giving suitable references with first orders, but even this deeply-rooted custom of the British trader does not seem to be insisted upon to anything like the same extent by traders of some other nations. They would appear to have a passion for orders, and "damn the consequences." We are not going to discuss the wisdom, or otherwise, of such a policy, or to enumerate the dangers that lurk in its wake; we are concerned more with the general effect of this growing tendency upon the foreign buyer, and its bearing upon British trade. The reports from countries toward which we are now casting more affectionate trade glances show how increasingly accommodating the German and American trader are becoming in the matter of terms of payment. "Give us your order—never mind about the money—any time will do for that." This bears more the complexion of friendship than of calculating business transaction, yet it is the latter undoubtedly with the accompaniment of that sort of friendliness which is now being used to foster business interests.

British manufacturers and traders have been warned that they must not be surprised if they find themselves at a disadvantage before long as a result of this policy of their competitors, and though our foreign trade statistics do not bear any surface evidence of that effect at present, the fact remains that financial reasons have lost us a number of contracts and concessions, so the matter is not one to put aside as of no importance. Whatever we are doing already, there is much more that we might do if we could secure a greater measure of financial support for the electrical industry. In France the same problem is receiving consideration at the present moment, for the *Temps* foretells the establishment very shortly of a French National Bank for Foreign Trade with a capital of £400,000 to begin with. As referred to in the *Times*, "the chief object of the new institution will be to enable French exporters to extend the short and inelastic terms of credit which they have hitherto offered, and to which the decline of French trade in various parts of the world has been freely ascribed."

Several years ago British electrical manufacturers were harassed by the enormous indebtedness of municipal authorities who took an unconscionable time to settle their accounts. The amount of municipal business is not large now, but it would appear to be necessary to prepare for large sums to be similarly locked up in foreign trade in future.

Telephone Troubles.

It has often been pointed out—by telephone officials—that the greatest cause of inefficiency of the telephone service is the inattention and inefficiency of the users themselves. While this may be regarded as an official view not untinged with

bias, there is a large proportion of truth in the allegation. Nothing is more annoying than on obeying a summons to the telephone, to be instructed by an office boy at the other end to "wait a minute," while he sets out on a protracted search for his employer, who has originated the call. It is a selfish and inconsiderate practice; the originator should hold himself in instant readiness to take up the conversation directly the person called arrives at the other end of the line. Perhaps those who adopt the former procedure do not realise the discourtesy of which they are guilty, in inviting a friend or client to cling to a telephone until it shall please them to relieve his suspense. In such circumstances it is justifiable to follow the example of those who, after waiting for a period of, say, one minute by the clock, hang up the telephone, with or without due comment.

A correspondent of the *Ironmonger* last week drew attention to a similar trouble, arising not from discourtesy but from lack of system. It is not an uncommon occurrence, when one calls up a business house, to be put through to one person after another, repeating the particulars of the matter in hand to each, so that by the time one gets into touch with the right official one is irritated beyond measure. The correspondent in question—Mr. A. Selden—suggests that this source of annoyance can be completely removed by the use of a telephone message form, with spaces for the name and address of the caller and the particulars of his business. This is filled up by the person who answers the telephone, and readily finds its way to the proper quarter, where it can either be dealt with at once on the telephone, or treated as ordinary correspondence. This device, made up in the form of a pad for the telephone desk, has proved very satisfactory, and we commend it to the notice of those in particular who have many departments in their offices, as well as to the telephone authorities.

As regards the troubles due to the operators, the worst, in our experience, is the annoyance of being cut off in the midst of a conversation, which happens so frequently that we are disposed to doubt the efficacy of the means adopted to prevent this trouble; either it is inadequate or it is ignored by the operators. Next to this is the undue delay in intimating that there is no reply—a delay often running into minutes. This is only aggravated by the complacent statements of the authorities that "the average time occupied in obtaining a reply from the exchange is x seconds; the average time from calling to obtaining communication is y seconds," and so on. These phenomenal records may be achieved in the course of official tests—we cannot say; but of one thing we are very certain: they bear no relation whatever to our own experience.

Osram Lamps. The Deutsche Gasgluhlicht Gesellschaft, of Berlin, which has just declared a dividend at the rate of 50 per cent. on the ordinary share capital of £330,000 for 1909-10, or the same rate as in the previous year, proposes to make a fresh increase of 5 per cent. preference shares of £330,000. The directors state that the past year has been specially favourable for both the incandescent gas department and the Osram lamp department. During the first half of the year, the introduction of taxation on illuminating articles caused an active demand to arise for the company's manufactures, and brought about an almost complete clearance of stocks. The prices in the second half of the year, particularly for Osram lamps, were reduced, although this circumstance favourably influenced sales. As a consequence of foreign Customs and patent legislation, the company, as is known, erected factories for the construction of Osram lamps in France and England, and the factories have developed satisfactorily, and now require to be extended. The proceeds of the new issue of preference shares, which are to be taken over by a syndicate, are to be devoted to carrying out these extensions, and to the increased provision of raw materials for the manufacture of incandescent mantles, and it is stated that the English factory in particular needs enlargement to meet the demand.

ALARM-SIGNALLING DEVICES FOR CIRCUIT-BREAKERS.

By S. LEES.

Some form of audible signal or alarm device is an almost indispensable adjunct to any switchboard controlling feeders on varying loads, the supply to which is liable to frequent interruption as, say, a tramway traction system. Hand-closed automatic circuit-breakers, which are invariably used for this purpose, often operate practically without making any noise, and, if the attendant is not near, there is great risk of the switch remaining open unnoticed. It is of the utmost importance that such an eventuality should be guarded against at all costs, as a stoppage of the service for any length of time would be a serious matter.

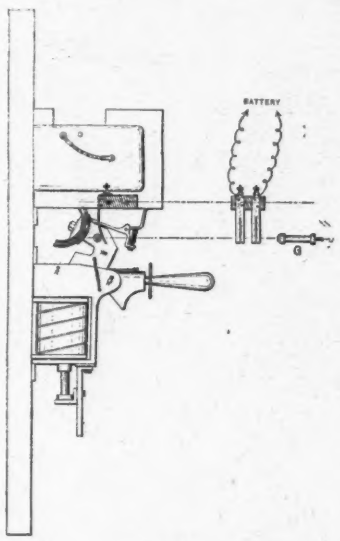


Fig. 1.

In order to minimise such risk of interruption it is the practice in most well-appointed stations to provide some form of automatic signalling device, which shall at once draw the attention of the attendant to the affected circuit. Such a device may consist of a simple form of bell-alarm, lamp signal, or a combination of both. Sometimes a

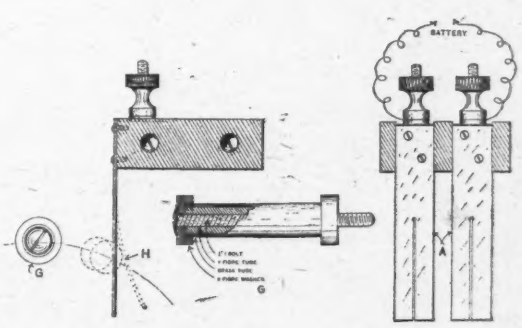


Fig. 2.

telephone relay working in conjunction with a circuit of lamps is used.

In nearly, if not all, types of circuit-breakers the switch-blade, brush-contact, or some component part or other moves through more or less of an angle during the act of opening. It is, therefore, fairly obvious that a bell-alarm device need not be at all complicated in design, as would otherwise be the case if some form of external tripping movement were necessary.

Fig. 1 illustrates a simple bell-alarm contact device, designed by the writer, fitted to a magnetic blow-out circuit-breaker of Bertram Thomas's S.A. type. This device has been tested in actual service under severe working conditions for many years, and has never failed, although the switch is in very close proximity to the circuit-breaker jaws. The detail sketches in fig. 2 show the construction of the device clearly. Good material is the first consideration. The switch blades A may be of either hard-hammered brass or german silver; the writer uses, and prefers, the latter on account of its superior non-oxidising qualities. The insulation mountings are of black vulcanised fibre.

Fig. 3 depicts a contact maker of a rather different type, having mercury for a conducting medium, fitted to an S B type circuit-breaker of the same make as the foregoing. Normally, when the circuit-breaker is closed, the position is as shown at B, fig. 4. On the circuit-breaker opening, the mercury falls by gravity, as indicated at C, and submerges the metal contact studs I, completing the bell circuit. The sketches, which are really self-explanatory, clearly show the details of its construction. This type of contact device has the advantages not only of simplicity and easy fitting, but also of being applicable to most types of circuit-breakers.

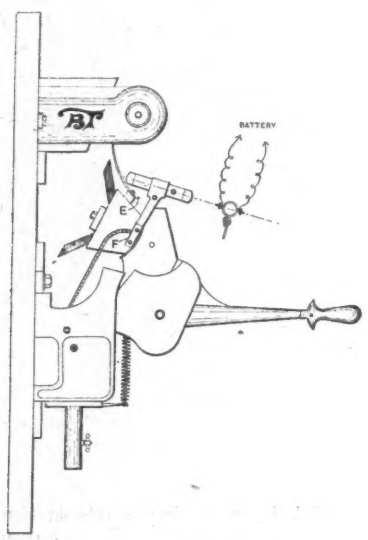


Fig. 3.

The clip holder D (fig. 4) is simply secured under the screw-heads of the "blow-out" subsidiary contact fingers E, or coil lead F (fig. 3). For this form of device the writer uses for the shell or casing and plugs, a good quality of red vulcanised fibre (spent cartridge fuse cases are suitable). An alternative design with screw-threaded plug is shown at fig. 5. Both these patterns have the advantage of being somewhat simpler to make and fit than the type described in figs. 1 and 2.

The mounting of auxiliary gear of the foregoing description on the face side of switchboards carrying heavy current apparatus is not favoured by some engineers, both on æsthetic and other grounds. To overcome this objection the alarm device is fixed on the "back" of the board, being usually operated by means of a spring-controlled plunger movement.

In fig. 6 is illustrated a type of contact maker fairly representative of this arrangement. In many cases ordinary door bell and burglar alarm devices are used, and the writer has seen small size lighting tumbler switches fitted up for the same purpose, but such stock articles usually possess the common faults of mechanical weakness and overcrowding of the working parts. Further, manufactured goods of the kind mentioned do not often readily lend themselves for adaptation to circuit-breaker work.

A weak point in many bell-alarm devices is that the point of contact is always the same. It is better to design the parts so that the contact members do not merely make "point" contact, but have, in addition, a sliding or rubbing action, which will render the switch, in a measure, self-cleaning. This condition is provided for in the device illustrated in figs. 1 and 2. On reference to the sketches, it will be seen that the short-circuiting roller, or pin G, slides over a considerable length of the surface presented by the blades,

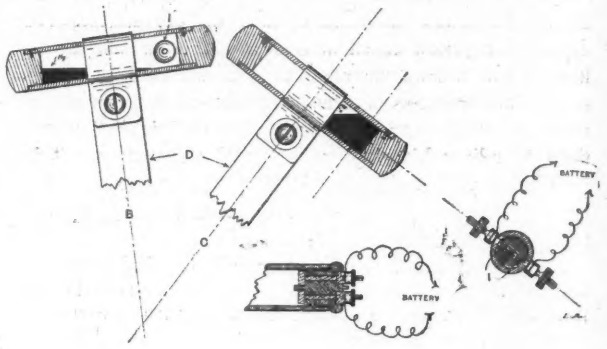


Fig. 4. Fig. 5.

as indicated, before finally coming to rest at the point marked by the letter H.

Another advantage of the apparatus described in figs. 1, 2 and 3 is that their action is positive—*e.g.*, the breaker switch must actually open circuit before the alarm is put in operation. This is not the case with other types of devices which are actuated by the plunger or trigger-striking movement, such devices being very liable to act prematurely, owing to the "floating" effect of the plunger or solenoid core.

The wiring for circuit-breaker bell-alarm circuits should always be run in protecting tube or casing, and carried away clear of the heavy-current gear, and should be insulated throughout. Some nasty mishaps have been known to happen through a policy of mistaken economy in using an earthed return. No external switch which can be left *permanently* in the "off" position should ever be used.

The choice of battery is much a matter of taste. Primary batteries, either of the wet or so-called dry type, work all right if given the proper attention. Secondary cells may, perhaps, stand more abuse, but they kick against ill-treatment with no less certainty in the long run. The selection of the alarm proper is also somewhat a matter of

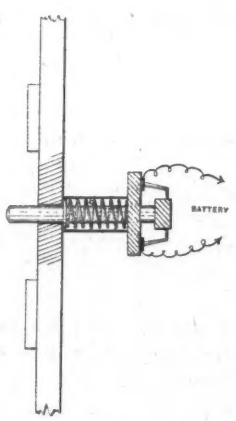


Fig. 6.

taste. A bell or gong is, perhaps, the most suitable, all considered; of the former, the continuous-ringing pattern is often used; this type certainly relieves the contact device of too much responsibility, but the resetting operation, of course, imposes an additional duty on the part of the operator or attendant.

Sometimes on large feeder systems, an indicator board, either shutter or lamp, is used in conjunction with the bell-alarms.

The alarm-signalling devices described in the foregoing article have been designed and made by the writer, and thoroughly tested under everyday working conditions extending over a goodly number of years. While nothing in the way of exceptional novelty is claimed for any of them, the apparatus have been described mainly with a view of assisting others who may possibly be contemplating the equipment of their own control gear.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

The Association of Mining Electrical Engineers.

As a member of the Association of Mining Electrical Engineers, I have been interested in the correspondence on the above subject which has gone on in your valuable columns, not forgetting your leading article.

I have been amused to hear our Council members laying out the bait; what moonshine it is, for instance, to talk about want of competent men for collieries. It is true generally there is a want, but not because they cannot be got, but for other vital reasons, which I need not mention, but which are well enough known.

I may say I have been connected with collieries for the last 20 years, and have held the official position of mechanical engineer, also of electrical engineer, on some of the largest and most modern collieries, therefore I know what I am talking about.

This Association really ought to be styled the Colliery Manager Convenience Association. I have raised my voice at branch meetings against the course which has been adopted, but colliery electricians have not yet got to the independence stage and learnt to crack the whip, and they will, in my opinion, be well lashed before they see their folly.

Where does the fairness come in? Take an engineer who has to serve an apprenticeship, educate himself and acquire knowledge, theoretical and practical, whether it be on a colliery or not; he cannot qualify or sit for a colliery manager's certificate unless he puts in at least two years' practical work down below. But if he be a pitman, or work underground, he need not be troubled about how his time is spent; if he can stand a cramming by some coach for a few months, he can qualify or sit for a manager's certificate without having to put in two years' practical work, or even two weeks in either an engineering shop or on the surface at all. Although three parts of the questions asked at the examination are engineering questions, he gets his ticket and then has the bounce over the very men who have to keep the pit going.

Surely there is room for reform here. Then again, the enginewright and the electrician, in spite of the Council's advice, are a sore point on many collieries. They ought to be, and really are, two separate and distinct trades; as one of your correspondents said, let the enginewright stick to his ropes and chains and the electrician to his wires and motors.

What if the Association do grant diplomas?—the most competent and best men do not get the jobs now, and won't then, any more than now; and to expect that practical men will come forward with all their experience and give it (as a "Non-Council Member" says) to colliery managers, deputies, fitters, tinkers, sailors, everybody about a pit, travellers, salesmen and anybody who pays his guinea, is, I think, beyond reason.

Let colliery engineers wake up, and play the game; their position was knocked under when the certificated manager came in, and he has now had a good innings; so let the developing power now so universally used, viz., electricity, be one of the steps to regain the standing of the engineer—not by educating everybody that pays his guinea, and showing the colliery manager how much you know, but by using the information you have, for your own improvement and benefit.

Tyne.

My previous correspondence was in reply to the criticism of the ELECTRICAL REVIEW, and I endeavoured to give a logical and broad-minded view of the policy pursued, on which I notice the Editors offer no further comment.

I have neither the time nor the inclination to follow up a discussion on the matter by correspondence, but I am quite prepared to have a discussion at one of our branch meetings on the matter with "Non-Council Member," and I have every confidence in proving that my previous statements are not *excuses* but justifiable facts.

I only repeat that the objects of the Association will be carried out, in spite of those members who appear to be only anxious to depreciate the Association rather than to support it; if "Non-Council Member" does not know the objects of the Association and has not studied the rules, he has evidently not been taking much interest in it, and I would advise him to obtain a copy of the same from his branch secretary or the general secretary. Had he only taken a little trouble in making inquiries from his branch secretary, he would have had clear replies to all his questions, and would know how the Board of Trade came into the matter.

Of course, I cannot help but appreciate his keenness, and only regret that he did not give his support earlier, but presume he was like a good many others, "Waited to see whether it was likely to be a successful formation or not," before he paid his guinea and received value of 45s., independent of other advantages.

His statement "plank down your guinea *or two guineas*," almost convinces me that his *nom de plume* is not a true one, and his letter generally is only a move to entice me into a discussion which I decline to enter into by correspondence.

A Council Member.

Tests on Bitumen Cables.

I have read with interest Mr. W. A. Toppin's article on "Tests on Bitumen Cables" in your last issue, and trust that I may be allowed to offer a word or two of criticism on it. The tests he mentions have evidently been carefully carried out by him, and most minute observations have been made. Reference to a manual of chemistry will show the composition of the yellow gas and oily fluid produced by igniting the bitumen. Further and more elaborate chemical and mechanical tests than those given by Mr. Toppin have, of course, been performed by bitumen refiners who have in many cases embodied the results in their catalogues.

In Mr. Toppin's leakage tests he neglects to give the principal components in the composition of the soil with which he has experimented, although he must know that the specific resistance of soil varies according to the elements of which it is formed. I am of opinion that if a cable with a pinhole in the bitumen covering be surrounded with any kind of soil with a slight percentage of moisture, the moisture will very soon find the perforation, and allow a leakage current to flow.

Regarding the heating of the soil through which a current is passing, the flat portion of the temperature curve (fig. 1) can only be due to the effect of the gradually decreasing current, and because of this I consider the curve is valueless from a practical standpoint, as the heating effect of a current passing through *any* substance is proportional to $C^2 R T$ where C = current, R = resistance and T = time.

I agree with the author in his remarks relating to the expansion and contraction of copper cables. Too much care cannot be given to the precaution of allowing some slack in laying the cable.

To further simplify the test for short circuits (fig. 2), I would suggest that L be a variable resistance and the second reading E_2 taken with the same current C_1 as when E_1 was noted. Then—

$$\text{Distance in yards from N to D} = \frac{E_1}{E_1 + E_2} \times \text{total length of cable in yards.}$$

Respecting Mr. Toppin's concluding remarks, I may say that I also look forward to the time when a good heating load will be obtained through the introduction of a more efficient heating apparatus.

Mains.

Municipal Trading.

Your correspondent "British Manufacturer" (a vaguely subtle *nom-de-plume*) proffers a reply to my letter *really* on "Municipal Trading." One would gather from his rambling and incoherent remarks that the subject under discussion was in reality "Tariff Reform," or "How to protect the British manufacturer from the effects of unfair foreign dumping," or "How the contractor exists otherwise than by persistent canvassing."

As my letter touched on neither of the foregoing points, I am constrained to recommend him to re-read my letter with the help of such enlightened assistance as he may be able to command. He will then be able, I hope, to dispense with his assumed *nom de plume*, for I cannot find it in my heart so seriously to libel any British manufacturer by attributing to him such a foolish and puerile communication. If my interrogator was a little more "British," and less of a "manufacturer," he would, in the first place, have sufficient pluck to subscribe his name, and in the second place, would avoid introducing fanciful side issues to fog the purport of my letter.

I may add that I never have, and never will, write under a *nom de plume*, regarding the practice as contemptible, and will not in future reply to letters whose authors prefer to remain in obscurity.

Duncan Watson.

London, *October 15th*, 1910.

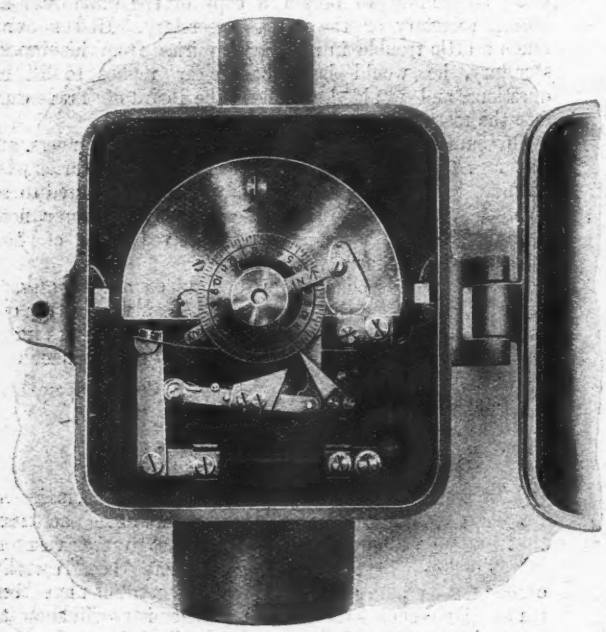


Fig. 1.—Time-Switch Box as Used at Leyton.

Balance System of Protection for Transformers.

In your article on "Transformer Protection," of the 7th inst., you have not mentioned that the system described bears a significant resemblance to that known as the "Merz-Price" system.

This system was developed upon apparatus of our design for the large power supply companies operating in the Northumberland and Durham districts, and we have since applied the system of protection to nearly all the static transformers connected to their 6,000-volt three-phase network, and also to many of their 20,000-volt transformers.

The apparatus is now made by us and a few other manufacturers, including the B.T.-H. Co., under licence from Messrs. The B.I. & H. Cables, Ltd.

A. Reyrolle & Co., Ltd.

Hebburn-on-Tyne,
October 12th, 1910.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

The "Venner" Time Switch.

The rapidly extending use of electricity for street lighting has brought time switches more and more into prominence, and various methods of fixing to lamp-posts have been devised to suit local conditions. The accompanying illustrations show the methods adopted for mounting the "Venner" time switch at Leyton and High Barnet. In the former case a watertight box is screwed in the run of the post like an ordinary hand-switch box, the nipples being made to suit individual requirements. At High Barnet the box, as shown white, is attached to the post with a strap, this method involving the minimum of alteration to the post—namely, the drilling of one hole only. In a new list just issued by Messrs. Venner & Co., of 6, Old Queen Street, S.W., these and other methods are shown, and some interesting notes are given relating to the mechanism of the clock itself, which, for this purpose, has to be of very high class, with lever escapement, jewelled pallets and jewel staff, and a Breguet hair-spring.

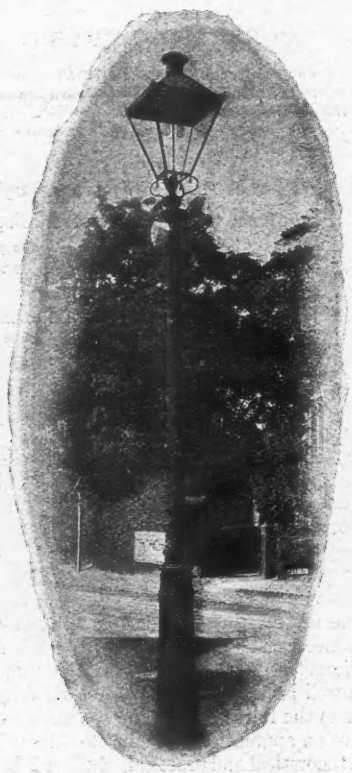


Fig. 2.—Lamp-post with "Venner" Time Switch, High Barnet.

Large Electric Clock.

Messrs. Gent & Co., Ltd., of Faraday Works, Leicester, have sent us particulars of the electric clock which they are building for the Royal Liver Insurance Co.'s new offices at Liverpool, and which, it is claimed, will be the largest in the world.

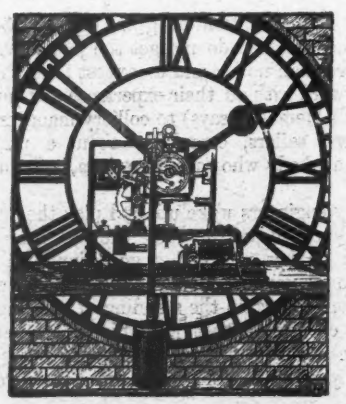


Fig. 3.—Gent's "Waiting Train" Electric Clock

The clock possesses four dials, and will be placed in a tower about 220 ft. above ground level; each dial measures 25 ft. in diameter, and the minute hands measure 14 ft. long and 3 ft. at greatest width. Each of the huge hands is made of copper, with 9-in. gun-metal ribs, of ample strength to withstand the wind pressure. The hours are indicated by 12 marks, each measuring 3 ft. × 1 ft. 6 in.: and 1 ft. 2 in. separates the minute marks.

The "waiting-train" movement invented by Messrs. Gent is employed to drive the clock with a practically continuous motion, and will be governed by a precision time transmitter designed by Messrs Gent, which is now being largely used in observatories in this country and abroad. The transmitter will be connected through the G.P.O. wires to Greenwich, and will be automatically corrected when necessary.

The dials of this large clock will be electrically illuminated, and a very ingenious switching apparatus is being made which will automatically switch on the light at dusk and switch it off at dawn. By an ingeniously arranged cam, mounted within the switching apparatus, the times of lighting and extinguishing are altered to suit the seasons automatically, the cam effecting this by a simple reducing gear, revolving once only in two years. The error due to Leap Years is compensated so nearly that the error remaining is only 10 minutes in 30 years, and at the end of this period it can be corrected and reset for a subsequent period of 30 years in less than one minute and without the use of tools.

The accompanying illustration, fig. 3, shows the mechanism of a similar clock on the "waiting-train" principle.

Siemens "G 4" Watt-hour Meters.

A meter embodying many valuable improvements has recently been brought out by Messrs. Siemens Bros. Dynamo Works, Ltd., of 39, Upper Thames Street, E.C., under the above title. All the working parts can be replaced without the aid of tools, and the parts are so designed that the replacement of any of them does not render recalibration necessary. In particular, the commutator, brushes, bottom pivot and jewel, the parts most exposed to wear, are easily renewed. Fig. 4 shows the interior of the meter, which is of the motor type, and is suitable for D.C. or A.C. circuits, up to 200 amperes at 650 volts. The armature is wound with three coils, and the commutator is attached to it with three steel springs, no

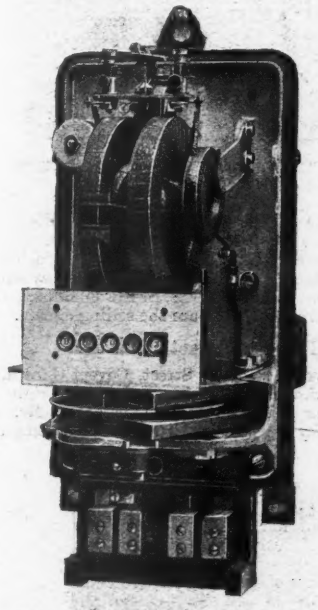


Fig. 4.—Interior of Siemens "G 4" Meter.

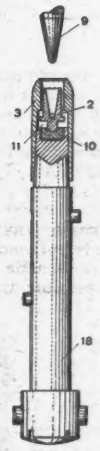


Fig. 5.—Details of Pivot and Jewel.

2, Interchangeable pivot point; 3, Oil cap; 9, Coned spindle end; 10, Jewel stone; 11, Oil chamber; 18, Stop screw.

solder being used, so that it can be detached with ease; the brushes are of silver strip with gold-wire bearing surfaces, and are arranged so that replacement can be effected without altering their position or pressure on the commutator. The lower end of the armature spindle is cone-shaped, and fits into the removable pivot, which, with the jewel, can be removed with the stop screw which locks the armature (fig. 5); during transit the pivot and jewel are withdrawn from the spindle, so that no damage can occur to them.

A sheet of iron is interposed between the driving and braking parts, to screen the magnets from magnetic fields due to excessive currents in the main coils, and the latter are placed a long way from the brake for the same reason, giving the meter its oblong shape. A compensating coil is provided to neutralise friction losses. The dial is of the cyclometer type, with machine-cut wheels. We are informed that the meter is particularly suitable for export work, and has been very favourably received abroad.

Simplex Holophane Fittings.

In a new catalogue of Holophane material just issued by Messrs. Simplex Conduits, Ltd., 116, Charing Cross Road, London, W.C., there are shown various reflectors, fittings, wireless cluster arcs, &c. A number of very neat examples of fittings specially designed for the Holophane system, and a variety of types of reflectors, are well illustrated, prices being plainly set forth in tabular form. The

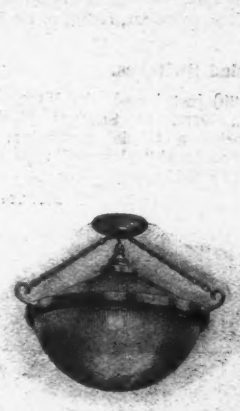


Fig. 6.—Reflector Fitting.

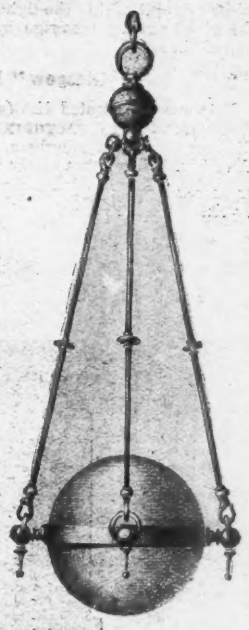


Fig. 7.—Sphere Fitting for Corridors.

fittings cover an extensive range in values, some being suitable for residence lighting and others for large public buildings. We show in fig. 6 a low priced reflector bowl ceiling fitting of 10-in. size, suitable for illuminating a small room 14 ft. × 10 ft. Fig. 7 represents a sphere fitting suitable for lighting corridors and so forth. In place of the ordinary chains, rods are provided through which the flexible is led, thus keeping it out of sight.

"Victor" Workshop or Factory Lamp.

Enclosed arc lamps are very largely used for factory lighting, but their great disadvantage is that the globes are very easily broken, and therefore the cost of upkeep is no small item. To reduce this as far as possible, the Electric and Ordnance Accessories Co., Ltd., of Cheston Road, Aston, Birmingham, have introduced the

Fig. 8.—"Victor" Workshop Lamp.

lamp illustrated in fig. 8. It will be observed that the lantern is hexagonal, and as the glass is only held in position by small copper clips, the cost of replacing a pane in the event of an accident is very small. No special globes need be kept in stock, thus also saving storage room. The lamps are complete as illustrated, the resistance being included in the case, thus making installation a very simple operation. The resistance is very effectively cooled by

means of the open joints in the split case. Both terminals are thoroughly insulated with mica or porcelain, and no live parts are on the outside of the lamp. Where lamps are already installed without this special lantern, we understand that the Electric and Ordnance Co., Ltd., are prepared to supply a stout wire guard for use where there is little head room to suspend the lamp, or where machines are placed close together. This guard is attached by means of spring clips to the outside rim of the metal reflector, and while not obstructing the light in any way, very effectively protects the globe against breakage by ladders, poles, &c., being carelessly moved about.

"Glasgow" Ironclad Switches.

In a new illustrated list (sheet 29) just issued, the Midland Electrical Manufacturing Co., Ltd., of Stafford Works, Conybere Street, Birmingham, give prices and brief particulars of their ironclad switches of the totally enclosed "Glasgow" type, for 600 volts. These switches have been specially designed to meet the

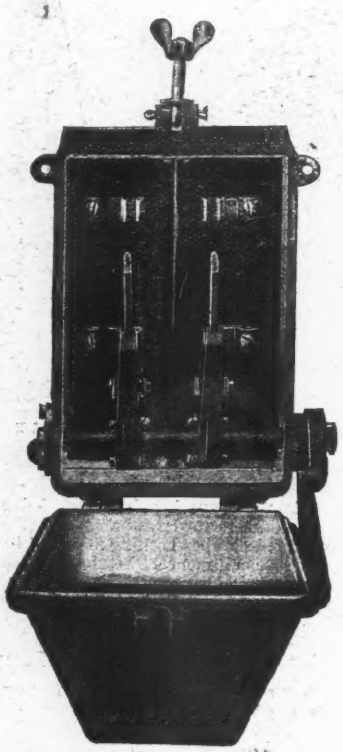


Fig. 9.—The "Glasgow" Ironclad Switch.

latest requirements of the Home Office, and they will also pass the Glasgow Corporation rules for 500-volt supply. In addition to strong design and good finish, the makers claim for the switch the following good qualities: foolproof, interlocking lever, double break, watertight, and asbestos-lined. Unless otherwise specified, switches are supplied with hardwood insulating bushes for cables.

Cable Connectors.

In their new list just issued, Messrs. Davis & Timmins, Ltd., of York Road, King's Cross, London, N. show full-sized illustrations

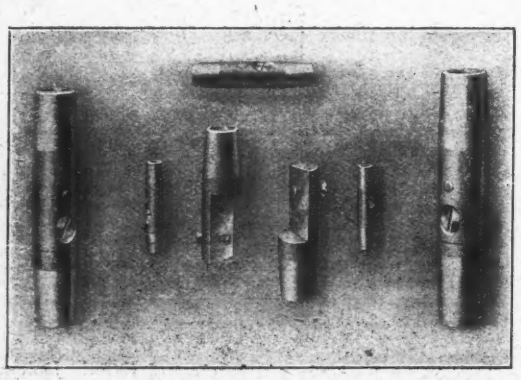


Fig. 10.—Davis & Timmins Cable Connectors.

of their standard cable connectors, which are made from solid drawn, bright drawn brass rod and are kept in stock. The firm have been prominent in this class of business for getting on for a lifetime and are known as well as anyone in the electrical industry. The connectors are accurately machined, and all halves are interchangeable with any other half of the same rating. They are extensively used for the fields and leading-out wires of dynamos and motors. We reproduce the illustration in reduced size herewith. The list tabulates dimensions and prices for connectors rated from 10 to 600 amperes.

Radiator Lamp Substitute.

A new heating device has been introduced by Messrs. F. A. Wilkinson & Partners, Ltd., in the shape of the "Economic" electric radiator lamp substitute; this consists of a heating element of wire, mounted on a bayonet holder base like a lamp, and covered with a perforated aluminium guard and reflector. It is very strong, being composed almost entirely of metal, and it attains a bright red

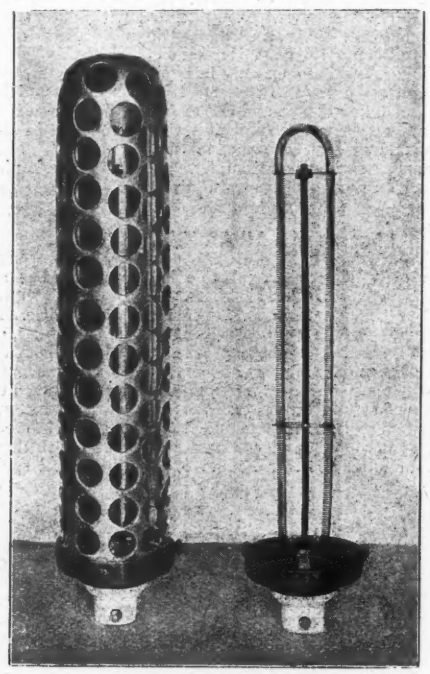


Fig. 11.—"Economic" Radiator Lamp Substitute.

heat when in use; as the heating element has a long life, and can be replaced at a small cost as easily as replacing a fuse, it should effect a considerable saving. The device is supplied in 500-watt sizes, and can be arranged to run two in series on any standard voltage from 100 to 250 volts. Messrs. Siemens Bros. Dynamo Works, Ltd., Tyssen Street, Dalston, are the selling agents.

A New (Patent) Magnetic Flasher.

Messrs. Veritys, Ltd., of King Street, Covent Garden, W.C., have recently acquired the manufacturing and selling rights of a new automatic flashing device from the patentee, Mr. A. H. Brackensieck, which they are now placing on the market as the

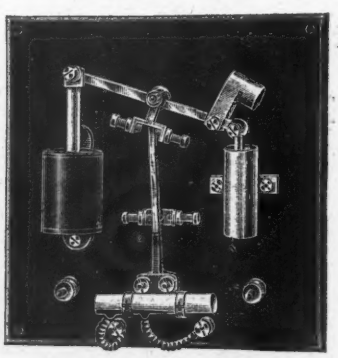


Fig. 12.—"Aston" Magnetic Flasher.

"Aston" magnetic flasher. This apparatus is actuated by the current which is taken by the sign passing through a coil having a solenoid, the action of which is damped by an oil dashpot, the make-and-break contact being effected by mercury in a tube, and with this apparatus any desired adjustment can be obtained; also the period of the "light and dark" can be correspondingly adjusted. The flashers are made in sizes from 1 to 25 amperes, either single-way or two-way, and are placed in simple series with the sign.

New Starter for Squirrel-Cage Motors.

In fig. 13 we show the interior of the Switchgear Co.'s new star-delta starting switch for squirrel-cage motors. It is made in several sizes covering starters from 5 H.P. up to 40 H.P.

The switch is claimed to be easy to manipulate, to have a decided off "click" when coming from the running position; also it is claimed that when turning from "start" to "run" it goes easily through the "off" position. The oil tank is of ample dimensions and there are barriers between phases in all sizes except the very small starters. There is an insertion joint (cotton packed) which

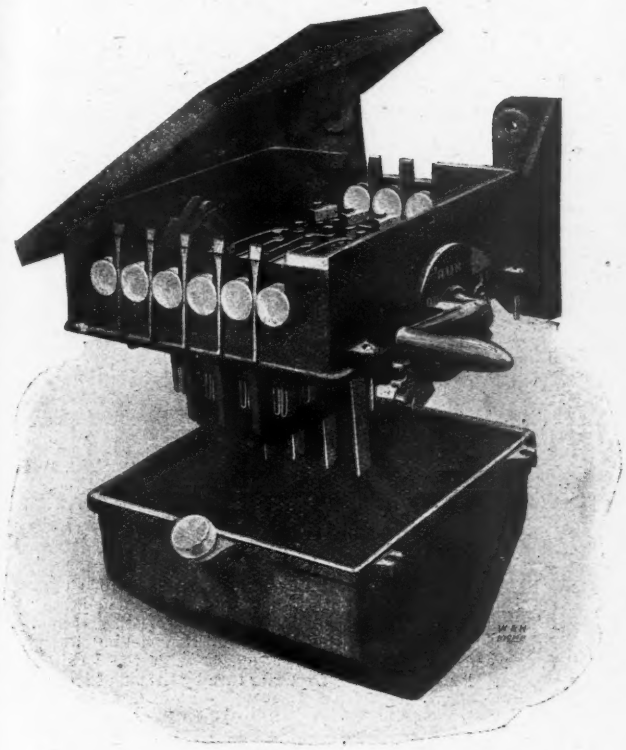


Fig. 13.—Starting Switch for Squirrel-Cage Motors.

prevents oil being slopped over. As some consultants prefer the auto-transformer method of starting to the star-delta, a special oil tank is fitted, when required, to contain the transformer. The latter is, however, mechanically supported from the mid-section which, as the illustration shows, is adapted for bolting to a wall or pillar. For wiring, therefore, both the top cover and oil tank can be removed without in any way interfering with the internal connections.

The combination is claimed to be unusually easy of access and, therefore, meets the need of those who have the actual coupling up of the cables to carry out. Automatic release switches are also manufactured by the Switchgear Co.

New "Metalik" Lamp.

Messrs. G. M. Boddy & Co. inform us that they are introducing a new "Metalik" lamp of specially strong construction, for use in factories, on board ship, for train lighting, and in other places where there is considerable vibration. The lamps are being shown at the Brussels Exhibition, mounted on an apparatus that subjects them to shock and vibration, and so far none of them have given out. They are made for pressures up to 125 volts, of 16 to 50 C.P., and are similar to the ordinary type, but have the filaments wound and arranged in such a way as to offer the greatest amount of resistance to vibration.

Sewing-Machine Electrical Equipments.

The Oerlikon Works have designed an electric drive for sewing machines, which is understood to be simple in working and to give excellent results. The motor has a very high efficiency, and all parts are robustly designed; the apparatus can be fixed to any machine. When the machine is stationary, the endless band driving it is slack, and a brake is pressed by means of a spring against the sewing-machine wheel. The motor is started by means of a tumbler switch fixed beneath the sewing-machine table. By pressing the treadle of the machine more or less, the motor is moved backwards, tightening or loosening the endless band as required. By this means a speed regulation within an almost unlimited range is obtainable. Lists illustrating the apparatus are in course of preparation and will shortly be issued, but in the meantime full particulars, &c., can be obtained at the Oerlikon Co.'s British and Colonial office, 34, Norfolk Street, Strand, W.C. (Mr. G. Wuthrich, chief engineer).

Electric Cooking Apparatus.

Messrs. O. C. Hawkes, Ltd., of 70, Aldersgate Street, E.C., have recently placed on the market a small grill, of modest price, which also provides for boiling water, &c., when the heat baffle plate is inserted under the units.

This cooker can be run from any lampholder by a plug and flexible connection.

Messrs. Hawkes also specialise in the Pharos stove, an apparatus which combines in itself a heater capable of well heating any ordinary sized room, a pair of boiling rings, a griller and roaster, a toaster and a plate warming rack.

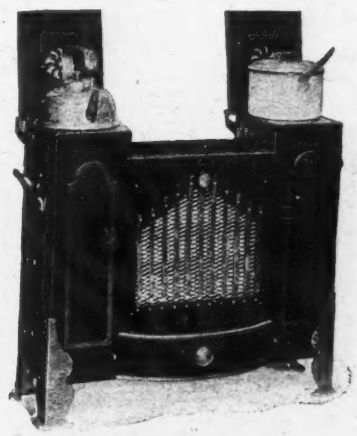


Fig. 14.—Pharos Stove with Boiling Plates in Use.

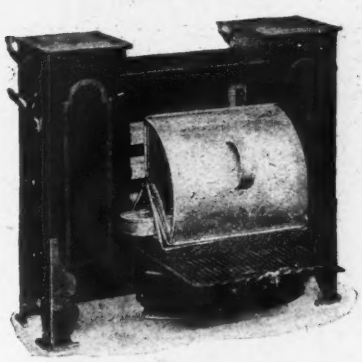


Fig. 15.—Pharos Stove Used for Grilling.

Our views show this stove (fig. 14) used for room heating, but with the side covers raised and a kettle and saucepan in use on the boiling plates which are provided on either side, and (fig. 15) with the front let down and a Dutch oven for roasting or grilling placed in front of the heaters.

The top plate is perforated to admit of air circulating through the stove and the central portion can be used for plate warming, &c.

The central heating and grilling elements are wired on two circuits giving three heats and each of the boiling plates is on a separate circuit.

The energy consumption of the standard stoves is 1,500 watts on the heater circuit and 500 watts on each boiling plate.

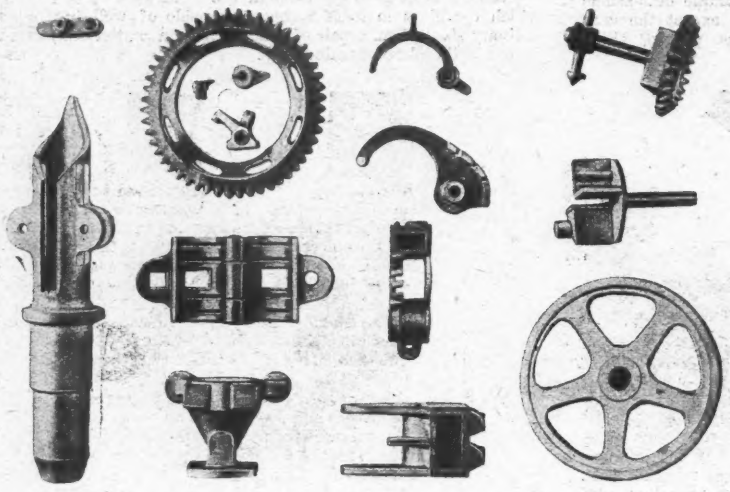
Attention may also be drawn to several new induced draught stove designs and to the XL combined electric oven, boiler and grill—a larger apparatus suitable for cooking on an extensive scale.

Die Castings.

The casting of small parts of machines in dies, so as to turn them out practically ready for use with the minimum of machining, is of great assistance in reducing the cost of production of machines manufactured on a repetition basis. The London Brass and Aluminium Die Casting Foundry (successors to Balbarrie and Hill), of 90-92, Banner Street, St. Luke's, E.C., is well equipped with plant for making the steel dies and tools required for the process, and for casting and electroplating on a large scale; as a matter of fact, the firm have been manufacturing die castings for about two years, and, owing to the facilities at their command, are able to deliver samples within three weeks of the receipt of an order, and full delivery a few days after the samples are passed. The brass used is made of pure copper and zinc, in the proportions of 66 per cent. copper and 34 per cent. zinc; aluminium of about 95 per cent. purity is also employed, and white metal composed of copper, zinc and aluminium, in proportions which can be varied according to the tenacity required. The white metal is suitable for all kinds of work not requiring the strength of brass, and is stronger than alloys containing tin or antimony, which are not used by the firm. Copper castings are made for electrical apparatus, and experiments have also been carried out with iron, and the

results are so satisfactory that the firm expects shortly to be able to accept orders for die castings in that metal.

The castings are produced to within $\frac{1}{100}$ inch in brass and aluminium, and to within $\frac{1}{1000}$ inch in white metal. Holes and slots can be cast in most cases, or centred where they cannot be actually cast; machining charges are reduced to the minimum, and the castings are interchangeable.



1 2 3 4 5 6 7 8 9 10 11 12

FIG. 16.—DIE CASTINGS IN BRASS, ALUMINIUM, AND WHITE METAL.

1. Brass bar for calculating machine.
2. Brass centre cylinder for contact gear of arc lamp (exact weight, 1 lb. 3 oz.).
3. Brass spur-wheel for speedometer; inside, pointer and cam piece for calculating machines, and guide for carbons of arc lamp.
4. Brass clamp for hose fittings.
5. Brass mercury chamber for meters.
6 and 7. Brass triggers for brush boxes.
8 and 9. Brass brush-boxes for dynamos and motors.
10. Aluminium alloy gear-wheel for automatic machines.
11. Plug-piece in white metal for electrical measuring instruments.
12. Aluminium wheel for automatic disinfecting machine.

Parts of dynamos, meters, &c., figure largely amongst the manufactures of the company, who supply brush-holder castings to many of the leading dynamo-makers, and the variety of the shapes and sizes of parts dealt with may be gathered from the accompanying illustration, fig. 16, reproduced from a quantity of samples that we have received from the firm.

"Multax-Century" Flame Lamp.

THE GLOBE ELECTRIC CO., LTD., of 11, Farringdon Avenue, E.C., inform us that they are about to put on the market a new 100-hour "Multax-Century" lamp; in general design it follows their 36-hour Multax lamp, but the mechanism is slightly different. The feed is effected purely by gravity, without any clockwork, and it is not a magazine lamp, the increased burning hours being obtained by the use of the Multax patent bridge-core carbons which have been successfully used in the 20-hour and 36-hour types. The new pattern has been designed especially for the illumination of streets, railway stations, dockyards, &c., and is provided with a special projecting reflector, as shown in the accompanying figure (fig. 17), which gives improved horizontal distribution of the light. As the first 500 lamps, we are informed, have already been definitely disposed of, there will be a delay of a few weeks before the lamp can be supplied in quantity.

Arc Lamp Coupling and Suspension Gear.

In public street-lighting installations one man can trim 80 to 85 lamps per day, when they are equipped with a good type of lowering gear, as against about 40 lamps per two or three men where older-fashioned methods prevail and ladders have to be employed. Hence such gear is of great importance, since it means a saving of at least 30s. per lamp per annum—a by no means inconsiderable amount in these days of contracts bearing but little margin of profit.

The "Smart" patent gear, which is being placed on the market by MR. S. MANSEL JONES, Western Mail Chambers, Cardiff, and is illustrated herewith, is designed on the hit-and-miss principle, being held in position and released by similar movements. In either raising or lowering, the lamp is first pulled up as far as it can go, and there is therefore no difficulty in finding the locking position.

There is only one moving part in the Smart gear (which is but 12 in. over all); this consists of a simple and durable loose gun-metal ring, provided with two projecting pins, which are placed diametrically opposite one another. Each time the cord or rope is pulled up, this ring is caused to make a quarter turn, owing to the pins in its side striking inclined arms or guide teeth on the body of the apparatus. The internal shape of this ring is such that it alternately locks and releases the flattened arrow-headed spindle attached to the rope, to which the lamp is also connected. A slotted guide causes this spindle always to enter the main casing in the same way, notwithstanding any swinging or twisting of the lamp; this permits of the use of substantial contacts, which can be firmly attached, and thus flimsy springs and drum contacts, which are apt to get out of alignment owing to the swelling or expansion of insulating material supporting and separating them, are avoided. This simplicity of contact is of much greater importance than it would at first sight appear to be, for this has been the weak point of many gears in the past, when exposed to inclement weather and subjected to the continuous swaying caused by boisterous winds.

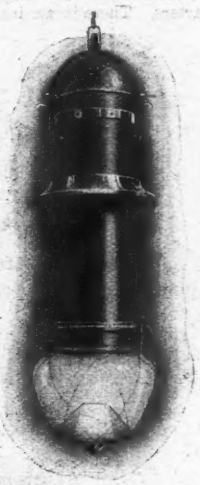


FIG. 17.
"MULTAX-CENTURY" FLAME ARC LAMP.

Referring to the illustrations herewith, fig. 18 shows the mechanism in the locked position, the dotted lines indicating the space occupied by the cover and weather-protecting casing. In fig. 19 it is shown unlocked and lowered. Here can be clearly seen the flattened arrow-head, which engages with the locking ring when the latter is revolved a quarter turn by the aid of its side pins and the guide teeth. One of the pins of this ring shows itself on fig. 18, but it does not appear on fig. 19, since, in the position shown there, the ring has been caused to make a right-angled turn, thus allowing the flattened arrow-head to pass through it.

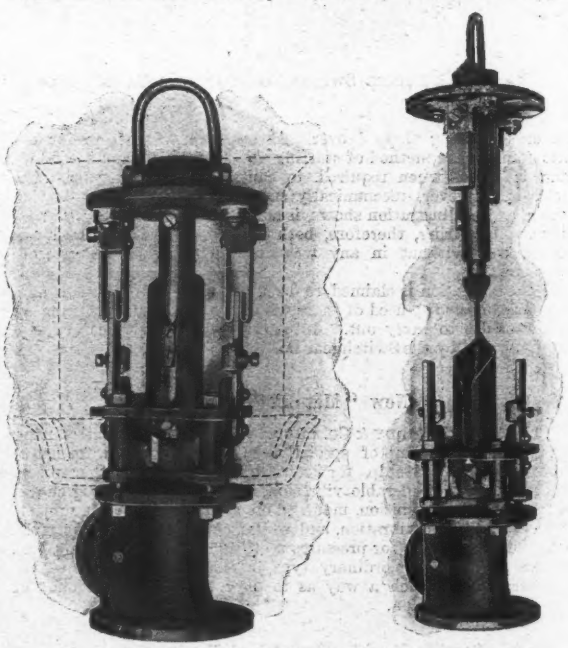


FIG. 18. FIG. 19.
"SMART" PATENT ARC LAMP SUSPENSION GEAR.

No weight is thrown on the electrical contacts, and as the swinging of the lamp cannot cause the contacts to work loose, since any such strain is taken up by the central spindle, arcing and burning out is eliminated. Further, all strain is taken off the rope. The simplicity of the gear has appealed to those engineers who have had an opportunity of examining it; yet this simplicity does not militate at all against its life under the strenuous conditions of everyday wear and tear, as has been demonstrated by long and careful tests before placing the gear on the market.

"Stannos" House-Service Box.

We recently mentioned the house-service box specially designed for use with the "Stannos" wiring system by Messrs. Siemens Bros. & Co., Ltd., Caxton House, S.W.; the accompanying illustration shows the construction of this device. It is particularly intended for supplying a row of houses from one service on the concentric system, the box, of galvanised cast-iron, being bolted to a wall out of doors if necessary. The low-pressure concentric

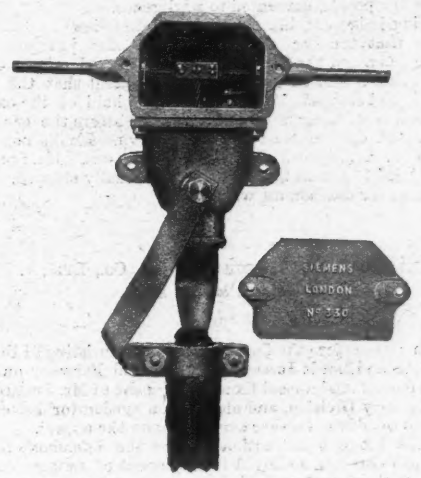


Fig. 20.—"Stannos" House-Service Box.

service cable enters at the bottom, the lead sheathing being wiped to the box, and the armouring bonded to the latter with a wrought-iron armour clamp. The outer conductor is bunched and sweated into a fitting which is bonded to the upper part of the box, inside, and the inner conductor enters a metal fitting which receives also the inners of the "Stannos" wires, the outer sheathings of the latter being sweated into glands which are connected inside the box with a copper strip. The lower part of the box forms a sealing chamber, which is filled with compound. The box illustrated is suitable for a service cable up to 0·05 sq. in., and "Stannos" wires up to 7/16 S.W.G.

LEGAL.

Griffiths and Another *v.* Edward Lloyd, Ltd.

[*Stud Trams Libel.*]

On October 13th this action was mentioned before Mr. Justice Lawrance in the King's Bench Division of the High Court. Mr. Bromley Eames and Mr. Hume appeared for the plaintiffs, and Mr. Barrington Ward for the defendants.

Mr. Barrington Ward said the action was brought by gentlemen named Griffiths and Bedell against Edward Lloyd, Ltd., and the *Star* Newspaper Co. Defendants owned the *Daily Chronicle*, the *Star* and the *Morning Leader* newspapers. His Lordship would be relieved of trying the case, which must have lasted a considerable length of time. The parties had wisely been able to come to satisfactory terms. A part of the terms was that he should, on behalf of the defendants, make an expression of regret. The alleged libels arose in this way. In 1907 the Moderate party of the L.C.C. adopted plaintiffs' patent G.B. system of tramway traction, which obviated the use of underground conduits or overhead wires. For reasons best known to the L.C.C. they did not allow plaintiffs to install the system themselves, and the result was that from first to last the system, as put in by the L.C.C., proved to be a failure, and had to be taken up. The position taken up by the plaintiffs was that the system put in was not their system at all, but was their system modified, without authority, to such an extent that it proved a dismal failure. The defendants were not concerned with that. They were merely concerned with the facts, namely, that the particular system put in by the L.C.C. in the Mile End Road had proved unsuccessful, and defendants criticised the Moderates of the L.C.C. for having allowed such a state of things to prevail. Eventually the system was taken up, and that sufficiently vindicated the action of the newspapers so far as their public duty was concerned. If the action had gone on, the issues would have been that there was no libel at all, that the articles were privileged, and that the defence of fair comment on matters of public interest covered the rest of the articles. It was quite clear that as to a large part of the articles, defendants would have been bound to succeed, because they were clearly privileged. With regard to the defence of fair comment, defendants recognised that when they commented on public matters, they must not invade private interests. They never had any intention of attacking the plaintiffs privately or their system *per se*. They attacked the system which was installed by the L.C.C. in the Mile End Road. It was honest political criticism inspired by honest political motives, and not by any malicious motive against the plaintiffs. At all times defendants opened their columns to letters from plaintiffs, and while the work was progressing they frequently consulted plaintiffs as to their views and as to the progress of the work. Plaintiffs had an installation of their system at Lincoln which they installed themselves, and which was working quite satisfactorily. Defendants agreed with the plaintiffs that the system installed in the Mile End Road was not plaintiffs' system at all, but was a costly caricature of it by the Moderate Party. Defendants' object had been attained by that system having been taken up, and not having been employed elsewhere in the Metropolis. If in the course of their articles defendants had in any way overstepped the mark, and had invaded the private rights of the plaintiffs, he was instructed to say they never had any idea or intention of referring to the plaintiffs or to their system as such, and if any part of the articles could be construed as a reference to, or reflection on, the plaintiffs or their system, defendands expressed their sincere regret.

Mr. Bromley Eames said, after his learned friend's disclaimer of any intention to attack the plaintiffs or their system, he was perfectly willing to accept that disclaimer as fully and as freely as it was offered. Plaintiffs had felt compelled to bring the action, because, in their opinion, the articles had overstepped the limit of fair comment. Defendants recognised that they had done so, and had agreed to pay a substantial sum in damages, and to make an apology in Court. The plaintiffs' system had been working perfectly well for a number of years at Lincoln.

In these circumstances, he concurred with his learned friend in asking his Lordship to approve the terms arranged.

The case was settled accordingly.

Charge Against a Tramway Official.

John Downes, late traffic manager with the Lanarkshire Tramways Co., and residing at Bothwell Road, Hamilton, appeared before Sheriff Thomson at Hamilton last week, on four charges of embezzlement, and was committed to prison pending further proceedings.

The complaint alleges that on October 22nd, October 30th, November 8th, 1909, and on January 6th, 1910, accused received from various persons sums of money, amounting in all to £750, for the purpose of purchasing shares in the Lanarkshire Tramways Co., of which sums accused embezzled £550.

He was apprehended in London last week, having disappeared from Hamilton about two months' previously.

Accused acting on the instructions of his agent, Mr. Nath. Cochrane, Hamilton, declined to emit a declaration.

Cable-Laying Arbitration.

At a meeting of St. Thomas Rural District Council, Exeter, on Friday last, the clerk announced the receipt of the award of Mr. P. Maybury, County Surveyor of Kent, the Arbitrator in the action brought by the Council against Siemens Bros. & Co., electrical engineers and contractors, to recover damages for extraordinary traffic over roads controlled by the Council through the laying of cables for the Post Office between Exeter and Taunton. The Arbitrator awarded the Council £852 3s. 7d. The amount of the claim originally was £1,621, but it was admitted that a portion of that would have to be disallowed. In reply to questions, the clerk said he thought the Council would get their costs as a matter of course.

Messrs. Siemens Bros. offered only £300 in the first place as compensation for damage to roads.

Settle *v.* The Sheerness and District Electric Power and Traction Co., Ltd., and Others.

Mr. Justice Channel in the King's Bench Division on Wednesday, sitting without a jury, heard this action, in which was tried the question as to liability for the death of a man through coming in contact with a live wire used to carry electricity to the works of the plaintiff.

Mr. H. F. Dickens, K.C., and Mr. Abinger, appeared for the plaintiff, and Mr. J. R. Atkin, K.C., with Mr. Eustace Hills, were for the defendants.

From the opening statement of Counsel, it appeared that the Electric Lighting Co. and the Queenborough Wharf Co. were the defendants, and the plaintiff claimed against them an indemnity in regard to compensation awarded by the County Court judge to the widow of a man in Settle's employ, who was killed by coming into contact with an exposed wire passing over a building on the Wharf Co.'s property, which was used by the plaintiff in the course of his business as coal merchant and washer. Part of the arrangement between the plaintiff and the Wharf Co. was that the latter should build for him a weighbridge house, and that power to work the cranes should be supplied by the Electric Co. In order to supply that power, poles were erected, and over the wires the power was sent at a very high pressure, in fact, 6,500 volts. The wire, which was uninsulated, passed over the roof of the weighbridge house at a height of only about 5 ft., and the roof could easily be reached by anyone standing on a truck. The deceased man Rothwell, who occupied the position of deputy manager to plaintiff, went on to the roof in October, 1908, to see if it was water-tight

and the question was, who was responsible for the accident? The agreement between the plaintiff and the Wharf Co. established the licence for the man to be there, and they had no right to expose him to a trap. The case of the Electric Co. was different, and the question arose as to whether the house was built first or the wire was fitted first; but it would be proved that the foundations were in before the arrangement was made for the supply of electrical energy. At any rate, said Mr. Dickens, the Electric Company were not entitled to have a high pressure such as that without the consent of the Board of Trade, nor were they allowed to have overhead wires within the reach of anyone without the sanction of the Board, and when the matter was before the County Court Judge the usual notice of indemnity was given by the plaintiff in respect of both companies, under the Workmen's Compensation Act. At first the Electric Co. said that they would take no part in the arbitration. The electric power station was a considerable distance from the wharf, and up to a certain point the supply cable was taken underground, but when it got to the Wharf Co.'s property it was carried above ground and over the roof of the weighbridge house at the wharf itself. It passed over the boiler house, but there the wire was cradled, and from there it found its way to the transformer where the pressure was reduced. But up to that point the cable was entirely uninsulated. It was said that public warning was given, but the only warning seemed to be that on one of the poles was the word "danger." The provisional orders of the Electric Co. of 1900 and 1903 incorporated the provisions of the Electric Lighting Act in relation to public safety. The Act said that energy should be supplied only by some system approved in writing by the Board of Trade, whose consent had to be obtained for placing wires overhead. The Board of Trade regulations for securing the safety of the public said that if the pressure exceeded 3,000 volts, it should be regarded as an extra-high-pressure supply to be approved by the Board of Trade. In both cases the defendants had infringed the provisions of the Act. Since the action the Electric Co. had diverted the line. So far as Mr. Settle was concerned, they had evidence that the weighbridge house was not quite completed at the time the man met his death. At that time a man was sent to the house to fix a telephone, and for that purpose he went on to the roof; he was warned of the danger before he went, but gave no warning to the deceased man, Rothwell, who followed him. He (counsel) submitted that the Electric Co. had been guilty of negligence, first of all, in placing the wire in that position over the place where they knew a house was going to be built. Even if they did not know at the time, allowing the wire to remain in position after they did know was negligence. Having been guilty of a statutory breach they would be liable to Rothwell's widow, Rothwell having been killed in consequence of that breach.

Mr. Jabez Watson, manager to Mr. Settle, in the course of his evidence, said that the weighbridge house was about 10 ft. high, and any one could easily step upon the roof from a van. There were danger notices near where the wire crossed the railway half-a-mile away, but he had seen no danger notices close to the weighbridge.

Josiah Thos. Hall, electrical fitter at the Sheerness Dockyard, said that he was employed in 1909 by the National Telephone Co. as inspector, and was at work on the weighbridge house when the deceased met his death. The wire touched him across the face, and he became rigid and fell.

Other evidence having been given as to the accident,

Mr. Maurice John Collins, of the Electrical Department of the Board of Trade, was called to prove the rules of the Board governing the supply of electrical energy. The Board, he said, before the date of the accident never gave their consent to high voltage overhead wires. A prosecution was directed by the Board of Trade against the Electric Co., and they pleading guilty were fined by magistrates at Queenborough.

Mr. Wm. B. Essen, electrical expert with 25 years' experience, said he had made a special study of electrical transmission.

Mr. Abinger: In your judgment, would the erection of a wire within 5 ft. of a flat house having an elevation of only 10 ft., be dangerous?—Certainly it would. I would carry the wires up higher or divert them, or put a cradle under them.

His Lordship: So as to prevent any one touching them?—Yes, and to prevent the wire from falling should it break.

Mr. Abinger: Is 6,500 volts extraordinary or common?—It is very common. We have pressures up to 30,000 volts now.

I thought they electrocuted in New York with 5,000 volts?—I have no experience. We do not put up wires for that purpose.

As the plaintiff was not present, Mr. Atkin suggested the possibility of an adjournment for his attendance resulting in a settlement.

His Lordship said if he were assured there was a possibility of a settlement, he would regard it as a sufficient reason for an adjournment. It was a very complicated case, and if fought out might go to the Court of Appeal and be very costly.

A conversation thereupon took place between counsel, resulting in the announcement by Mr. Dickens that the case had been settled upon terms to be drawn up.

Newcastle Tramway Accident Claim.

At the Newcastle-on-Tyne County Court on 12th inst., Judge Greenwell gave judgment in a case in which Hannah Maria Hood claimed £30 12s. 6d. damages for personal injuries from Newcastle Corporation in respect to an accident alleged to be due to the negligence of an employé on the Corporation tramways.

The plaintiff's case was that on April 25th last, while at Barras Bridge, she hailed a tramcar at a stopping place. The car stopped, and plaintiff had her right foot on the step of the car, when suddenly the car started with a jerk. She fell, and was dragged several yards. Her left side was badly bruised, and her clothing was destroyed. She was confined to bed for three weeks.

Two other witnesses corroborated the plaintiff's statement.

For the defence both the driver and conductor of the car, and a constable, all declared that the car never stopped.

For the plaintiff, Mr. Mundahl submitted that the fault of the car appearing to stop, and the fault of the conductor not being there to warn people, amounted to negligence.

In giving judgment, his Honour said the view he took of the case was that the car slowed down at the junction as was customary, to avoid the trolley pole being jerked off the overhead wire, and that it slowed down to such an extent that the plaintiff thought it had stopped. The plaintiff got hold of the car rail—with a view of getting on it as it stopped—before the car stopped, and when the car went on she was thrown. He did not see that any case of negligence had been made out. He found that plaintiff tried to get on the car before it actually stopped.

Judgment for defendants, with costs.

"Z" Electric Lamp Manufacturing Co., Ltd., *v.* Marples Leach & Co., Ltd.

Appeal.

This case came before the Court of Appeal, consisting of the Master of the Rolls and Lords Justices Moulton and Farwell, on Friday, upon the defendants' appeal from a judgment of Mr. Justice Parker in the Chancery Division, and also upon a motion for leave for the defendants to adduce further evidence upon the appeal.

Plaintiffs brought the action against the defendants for an injunction to restrain the alleged infringement of Letters Patent No. 21,654 of 1906 granted to J. Y. Johnson for "Improvements in the manufacture of filaments for incandescent electric lamps," the alleged invention relating to lamps having a metal filament. Before the date of the letters patent there was always a liability of blackening when the lamps were exhausted, and the invention in question was said to prevent that by adding to the filament, either in the making or when made, or painting on to some part of the lamp, a substance called phospham, which was a mixture of phosphorus, nitrogen and hydrogen, and it was said that the result of the use of it was that it removed the carbon. The proceedings at the trial were reported in our issue of February 18th, 1910 *et sqq.* Mr. Justice Parker granted an injunction in the terms of the statement of claim, an inquiry as to damages, and awarded to plaintiffs the costs of the action. From this decision the defendants now appealed.

Mr. T. Terrell, K.C., Mr. M. Courtney Terrell and Mr. MacConkey appeared for the appellants; and Mr. A. J. Walter, K.C., and Mr. Colefax for the respondents (plaintiffs).

Mr. Terrell, in opening the case, said that the defendants appealed from the decision of the Court below, upon the grounds that the learned Judge was wrong both in fact and in law. Turning to the specification, the learned counsel said that, upon the issue of infringement, it was necessary for the Court to see precisely what the invention claimed was. The second point of consideration was, was it proved that the defendants had taken the invention claimed? He contended that this was a chemical patent. It was for a process for completely removing carbon from the filaments, so that their strength and serviceableness might be improved. He contended that the evidence did not show that the process described had any effect upon the removal of the carbon, and that the removal of the carbon did nothing so far as the specification was concerned.

The contention on the other side was that the specification was addressed not to chemists but to lamp manufacturers. That was to get over the difficulties in the specification, which to the eyes of the chemist would look like nonsense. He criticised the specification in this way. He said that the specification did not, in fact, disclose any method of removing carbon even at that date. Plaintiffs had got to prove infringement. He (counsel) was not put to the trouble of disproving infringement before it was proved against him. The learned Judge, having regard to a point made in the evidence, said that the burden of proof was shifted. He said in effect that because the defendants had used phospham he must infer that the defendants did remove carbon by means of the process, and that the burden of proof was upon the defendants, and they had not shifted that burden. At the date of the plaintiffs' patent "blackening" was a well-known evil. He submitted that the specification was nonsense so far as chemists were concerned, because it talked about nitrogen when it ought to talk about ammonia. At this time it was common ground between them that the blackening of these lamps was the great thing which impeded their sale on the market, and if the patentee had aimed at telling the world how to prevent the blackening he said nothing about it. He used the word "serviceableness," which pointed to the fact that what was aimed at was the quality to be obtained by improving the strength of the filament. Counsel contended that the interpretation put on the specification by his learned friend was contrary to its language. Claim I was for removing carbon from the filament by phospham. No one could infringe who did not remove carbon from the filament by means of phospham. He also submitted that as to the second and third claim, there was no infringement by the defendants. The claim did not include the removal of oxygen, but was only for the removal of carbon by phospham. The removal of carbon by ammonia was not claimed. Defendants' lamps were flashed in an ammonia atmosphere, and if after that use of ammonia phospham

was put on the atoms there was no infringement. Practically all the carbon was removed from the defendants' filaments, before they used phospham, and the phospham, in fact, did not remove any carbon. Having read the plaintiffs' specification in its entirety, the learned counsel said that what the plaintiffs had to prove on the issue of infringement was not that the defendants had made good lamps, but that they had removed carbon by the use of phospham. He submitted that unless they proved that, they must fail on the issue of infringement.

At this stage the learned counsel read the evidence given in the Court below, already reported.

Arguments in support of defendants' appeal having concluded, on Tuesday their Lordships, without calling upon counsel for the plaintiffs, dismissed the appeal with costs.

PROCEEDINGS OF INSTITUTIONS.

Association of Mining Electrical Engineers.

On the 7th and 8th inst. the annual meetings of the Association of Mining Electrical Engineers were held at Newcastle-upon-Tyne, and were very well attended by members from all over the kingdom. The proceedings opened on Friday afternoon with a Council meeting at Armstrong College, followed by tea and the annual general meeting in the Electrical Engineering lecture theatre of the college. After this a company of 60 sat down to the annual dinner at the County Hotel, a good menu and excellent programme constituting the pleasures of an enjoyable evening. On Saturday the members proceeded down the Tyne on a steamer kindly placed at their disposal by the Tyne Commissioners, visiting the Carville power station, and thence travelling to South Shields, where the electrical equipment of the Harton Collieries formed an object lesson of great interest. Among other subsidiary attractions may be mentioned a demonstration of the Holmes-Page fire-damp detector (which was described and illustrated in a recent issue) at the Armstrong College, and a visit to the works of Messrs. A. Reyrolle & Co., Ltd., at Hebburn, where various types of iron-clad high-tension switchgear, &c., were shown.

Chief interest centres on the annual general meeting and the dinner which followed it; the former, because the policy of examination as applied to mining electrical engineers was outlined by the President, Mr. Wm. Maurice, of Hucknell Torkard, and the latter because of the evidence of cordial relations between the new Association and kindred societies—a very happy outcome of the controversy which existed some little time ago.

The annual report of the Council, read at the general meeting, was interesting as showing remarkable progress since the inaugural meeting held on December 17th last. Centres have been established at Newcastle, Leeds, Manchester, Nottingham, Birmingham, London and Cardiff, and regular monthly meetings held at these branches. The causes and means of prevention of electrical accidents in mines were the subject of papers and discussions which have been summarised and presented as the Association's collective evidence to the Electrical Rules Revision Committee. The appointment of Mr. E. K. Scott as editor of *Transactions* was announced and subsequently confirmed by the meeting, and it was announced that the incorporation of the Association was practically complete, the title having been changed from "Institution" to "Association." Since December last the membership had increased from 424 to 614 at the end of June, and a new branch has been formed at Whitehaven. The financial position of the Association is satisfactory, the working account showing general expenses, including Council meeting charges and the provision of an official organ, of £331 7s. 10d. and branch allocations of £99 12s. 7d., and a balance to the credit of the profit and loss account of £49 8s. 2d.

It was announced that an anonymous member of the Association had offered a prize of £5 for the best paper written by a practical mining engineer during the coming winter on the subject of electricity in mining. A general discussion then ensued upon the various points of policy and organisation to be adopted by the Association.

Mr. Glynn Williams referred to complaints which had reached him regarding electrical information contained in the official organ of the Association. He did not, however, wish to associate himself with these complaints. It was pointed out in reply that the journal mentioned was at the present time discharging its duties to the Association at a considerable financial loss.

Mr. H. W. Clothier thought that in any discussion of the relative value to the Association of mining and electrical papers, due recognition should be made of the immense service which the purely electrical papers had rendered in promoting the objects of the Association. It should always be remembered that it was in the correspondence columns of an electrical paper that the movement was originated which culminated in the formation of the Association.

The President, Mr. Maurice, then read his presidential address. After touching upon the position that the Association must not be limited to mining electricians, but must have the co-operation of every section of the mining community in any way interested in electrical applications, he passed on to the question of examinations and certificates. The by-laws provide for an Examinations Board, and the Council is preparing for its early formation, and to establish a minimum standard of attainments and qualifications for candidates. It is not an easy matter to define the necessary qualifications of a mining electrician, having regard to the wide variations in type and plant capacity of existing colliery electrical installations. Mr. Maurice suggested that a man who was to take charge of a colliery installation of average output could not safely possess less knowledge of his work than was necessary to obtain a journeyman's certificate in electric wiring and fitting as required, say, by the City and Guilds of London Institute. In addition to this, practical experience underground would seem to be necessary, including a certain knowledge of mining, mining law and mining risks. He should know something of mine gases, coal dust and ventilation. He should know what demands might be made upon a motor equipment at a colliery. He should have some knowledge of sinking, pumping, winding, haulage, ventilating, and so forth, and of the conditions favourable or unfavourable to the use of electricity in these applications. If he would know how to keep electric coal-cutters in safe working order he must understand something about the methods of working coal. All this really amounted in practice to nothing more than a wireman's training plus a course in mining according to, say, the average County Council standard. An examination covering the ground indicated would afford a fair test of ability to take charge of a mining installation. Evidence of practical experience in a mine, personal character and general practical fitness should precede the examination, which should include both theoretical and practical tests.

With regard to "old hands" who, though thoroughly reliable, could not pass the theoretical part of the examination, something in the nature of a service certificate could be granted on, say, evidence of responsible charge of a colliery installation of an average size for an unbroken period of five years. Such offer should, however, remain open for a limited period only—say 12 months. The question of what a mining electrician ought to know demanded an answer before the Examinations Board could begin its work. Appended to the paper was a syllabus of electric wiremen's work, comprising the complete course preparatory for the City and Guilds of London Technological Examination, extending over three years.

In the discussion which followed, Dr. Thornton thought that for greater definition in the branch discussions on the paper a typical examination paper should be drawn up and circulated, and pointed out that the requirements of the Association involved the knowledge of more heavy electrical machinery than was included in the City and Guilds wiring course.

Mr. H. Jenkins said the Yorkshire branch was much against the institution of certificates by examination.

Mr. J. H. C. Brooking advocated the appointment of a small Sub-Committee to draw up questions, and the institution of examinations as soon as possible.

This was supported by Mr. Clothier.

Mr. Maurice said that there were too many contentious points in the scheme to permit of immediate action, and the examinations could not be instituted before the incorporation of the Association. At the present time the examinations would have to be fairly easy, being stiffened as time went on. Even so, he doubted whether, without preparation, men could be found to sit successfully for such an examination.

This was contested both by Mr. Clothier and Dr. Thornton, who said that he could pick 50 men in the Newcastle district who could sit at once for any reasonable examination.

On the motion of Mr. G. G. L. Preece, it was decided to form a sub-committee consisting of Messrs. Maurice, Thornton, Williams and Fisher, to draw up and issue a typical examination paper for discussion at the branch meetings. The meeting was then brought to a conclusion.

The dinner of the Association was subsequently held at the County Hotel. After the loyal toasts, "The Association of Mining Electrical Engineers" was proposed by Dr. Thornton, who said he was glad that the change of title of the Association had removed the unpleasant feeling which was freely voiced at Manchester about a year ago. They had a long way to go in order to reach the standing of the older societies, but he thought that in 15 or 20 years such standing would be secured.

The President, in reply, said that it had become incumbent upon collieries to adopt the best electrical apparatus and methods, and these created a demand for a higher type of craftsman to operate them—a demand which it was difficult at present to satisfy. Colliery operating engineers were not keeping pace with the designers of electrical plant, and the operating efficiency of machinery was thereby reduced. There were at present too many men on the borderland between skilled and unskilled engineering, and a new race of electricians was required. He was glad to find that the best type of men were coming into the Association, which had a strong educational influence.

Mr. J. H. C. Brooking, in proposing the toast of "Kindred Institutions," pointed out that in those institutions engineering matters were discussed chiefly by designers and not by those concerned in installing and running the plant. In their own Association the practical man was encouraged not only to take part in the discussions, but to assist in the organisation of the Association.

Mr. C. Faraday Proctor, in response, as chairman of the Newcastle Local Section of the Institution of Electrical Engineers, offered a hearty welcome to any members of the Association who cared to come to the meetings of the Institution.

Mr. A. B. Gridley then proposed the toast of "H.M. Inspectors of Mines," and coupled with the toast the names of Mr. Atkinson and Mr. Robert Nelson.

Mr. W. C. Mountain replied to the toast in the absence of Mr. Nelson. He said that while a large proportion of electrical troubles in collieries was due to faulty installation, it was anomalous to find plant of the value of, say, £10,000, left in charge of a man

drawing 24s. a week. The sooner that was done away with the better. In any case the wages of a really good man would be a decimal of 1 per cent. of the running costs and capital charges. The electrical engineer in a colliery at present occupied a very minor position, being in most cases under the colliery engineer.

Mr. R. Hood Haggie proposed the toast of "The Guests," and after Mr. J. S. Watson had welcomed the Association members to Carville on the morrow, Mr. Roberts, the chief electrical engineer to the Durban Corporation, expressed his interest in the coal-mining industry, and said that in Natal this was a rapidly growing industry which would one day reach very large proportions. Already the port of Durban was the largest coaling station in South Africa.

Mr. H. L. Riseley proposed the health of "The Chairman," which was drunk with musical honours.

Mr. Maurice, in thanking the members, referred to the work of the officers of the Association, including that of Mr. St. Clair Saunders and his brother, Mr. Glynn Williams, Mr. Clothier and Mr. Fisher.

Mr. Saunders, Mr. Williams and Mr. Clothier then responded, and after Messrs. C. E. Elder, G. E. Carr, G. Findlay and E. W. Husband had been thanked for the excellent musical programme which they had provided, the proceedings terminated.

THE BOOK-KEEPING AND ACCOUNTS OF TELEPHONE UNDERTAKINGS.

By GEORGE JOHNSON.

Many foreign telephone concessions are owned by British companies which usually have their chief office in London, periodical accounts and returns being rendered thereto by the local office abroad.

The books in general use in the London office are of the usual description—including ledger, cash books, journal and purchase book; whilst for the keeping of the accounts rendered from time to time by the local office, a local office ledger, journal and cash book are in vogue.

In the local office we may find, *inter alia*, the following books in use: Register of Contracts, Register of Due Dates, Cash Book, Journal, Purchase and Sale Books, Receipt Books, Stores Ledgers, and others. It will be convenient, probably, to treat of these latter books and accounts at the outset.

.....Day. .....Date.						.....Day. .....Date.						
No. of receipt.	Name.	Address.	Service.	Amount of receipt.	Amount collected.	No. of receipt.	Name.	Address.	Service.	Amount of receipt.	Amount paid.	Remarks.
			Total ..									

..... Signature of collector.

	£ s. d.
Total of receipts	
Total amount collected..	
Difference being amount of receipts returned.	
Analysis of payments:—	£ s. d.
Public lines..	
Private lines	
Removals	
Bells, &c.	
or	
Total amount paid to credit of London office account at Bank.	

(Same as counterfoil—given to and returned by collector.)

Perhaps the primary book of importance in a telephone undertaking is the Register of Contracts, which, as its name implies, contains a record of all service contracts entered into between the company and subscribers, and which is arranged alphabetically. Its design should provide for the number and date of the contract, name and address of subscriber, particulars of installation, charge for service, due date of charge, folio of entry in Due Dates Ledger, and any other salient details, the contract itself being carefully filed, with a reference thereon to its record in the Register of Contracts.

It is almost needless to observe that the exercise of the greatest care is necessary in the direction of ensuring that every such contract, which constitutes an undertaking on the part of the company to render a certain service in exchange for a certain payment, is duly and promptly entered in the Register; and it is of equal importance that an entry corresponding therewith is made in the Due Dates Register, as it is from that Register that the accounts or receipts are prepared as they become due, according to the precise practice adopted.

The Due Dates Register is arranged in order of date. For instance, the A. B. Co. enter into a contract for a certain telephone service, the contract being recorded under letter "A" in the Contract Register, while the Due Dates Register contains the necessary record in datal order, spaces being allotted for each date of the year, or cards may be used for the purpose.

Where the receipts of the subscribers are due principally to personal collection, it is a common practice to prepare the receipt forms, as the subscriptions become payable, from the Due Dates Register. These may be entered in a suitably ruled book with counterfoils, somewhat as set out in the previous column.

After this they are handed to the collector, who signs for them in a space provided for that purpose where shown on the counterfoil. Upon the completion of his daily round the collector hands to the cashier his return as shown above, together with the total amount of his collection and the unpaid receipts, which are checked with the cash collected and the return as shown by the analysis indicated at the foot of the form above. The cash is then entered in the Cash Book, and paid into the bank by the cashier, the receipts which have been returned being put into a deed-box or safe, which is, of course, kept under lock and key. The receipts returned are entered on each subsequent day's return until the amounts which they represent are collected. The collector's returns, after being agreed with the counterfoils of the Receipt Book, are filed and used as vouchers, in conjunction with the counterfoils of the Receipt Book.

Two Cash Books are in use generally—a principal Cash Book and a Petty Cash Book. Both books should be kept in an analytical form, and the entries, particularly those in the former book, should be as detailed as possible, inasmuch as copies of the entries in both books are sent monthly to the London office with the vouchers corresponding therewith.

The form of the principal Cash Book may be on the following lines. A few of the headings are given in the forms:—

Dr.														Cr.												
			Account to be credited.														Account to be debited.									
Date.	Name.	Particulars.	Exchange.	Private lines.	Bells.	Free Messages.	Removals.	Installations.	London office (Bank).	Local office (Bank).	Details.	Total.		Date.	Name.	Particulars.	London office (Bank).	Local office (Bank).	Stores.	Wages.	Salaries.	Directors' Fees.	Rents.	Fuel and Lighting.	Details.	Total.

Keeping the principal Cash Book in the form indicated facilitates the preparation of the monthly cash statement for the London office, and particularly so when the local Cash Book is not a posting medium, the Cash Book being probably journalised monthly, and the entries posted direct from the Journal to the Ledger. The commercial code (if there be one) of the particular country or State should be consulted in each case, seeing that it will state what books are by law essential, and to some extent, in a cursory manner probably, how they are to be kept.

The Petty Cash Book may be in the following form:—

Receipts.			Payments.				Allocation of payments.								
Date.	Particulars.	Amount.	Date.	Name.	Particulars.	Amount.	Stores.	Printing and stationery.	Postages.	Telegrams.	Travelling expenses.				Total.

All the entries in the principal cash book and the petty cash book are journalised monthly, and a cash statement prepared in the following manner for the London office, viz.:—

Cash Account for the month of.....19 .

Dr.			Cr.	
Particulars.	Amount. Currency.		Particulars.	Amount. Currency.
Balance from last month			Cash transferred to local Bank account as per contra, and as per Bank statement annexed (1)	
Cash drawn from bank (London office account) as per Advice No. ..			Deposits with Bank (London office account) as per Bank statement amended (2) ..	
Payments by Bank from local account as per Bank statement annexed (1)			Payments—	
Receipts from subscribers, &c. (L)—			Stores .. .. (a)	
Exchange			Wages .. .. (b)	
Private			Salaries .. .. (c)	
Fee messages			Shipping charges (d)	
Removals			Printing and stationery .. .. (e)	
Installations .. .. &c.			Rents .. .. (f)	
Sales (M)			Fuel and light .. (g)	
Sundry debtors (N)—			Customs duties (h)	
Exchange			Travelling .. (i)	
Private			Commission .. (j)	
Sales .. .. .. &c.			Legal .. .. (k)	
(Other sources of receipt to be indicated under suitable headings, accompanied by details on special sheets.)			(Other forms of expense) to be indicated under suitable headings, accompanied by details on special sheets.)	
			Balance	

The form explains itself. Accompanying it are separate sheets corresponding with the alphabetical letters indicated, giving the necessary details, and to these sheets are attached the necessary vouchers. For example, the form of sheet may be as follows :—

(To accompany Cash Statement.)

Shipping Charges (*d*).

Particulars of charges paid during the month of.....19 .

Date.	Name.	Particulars.	Voucher No.	Amount.	Allocation.			
					Capital.		Revenue.	
					A/c to be debited.	Amount.	A/c to be debited.	Amount.

The actual wages and salaries sheets accompany the statement (*b*) and (*c*), copies being retained for the local office use. We shall notice the forms presently.

Statements prepared and certified by the Bank, and sent direct to the London office ; which assist in vouching items (1), (1) and (2).

It may be observed that it is a common practice for all local receipts to be paid into the bank to the credit of the London office, and for the local office to submit to the London office particulars of their cash requirements for equal periods for approval and authorisation of expenditure. The sums so authorised are then transferred from the London head office account to the local office account as may be required, the bank and the local office receiving the necessary advice from the London office.

Home remittances, or transfers from the head office account at the local bank to London, are arranged in the ordinary way. The forms of the wages and salaries pay-bills may be as follow :—

Wages Pay Bill for the ....., 19 .

Name.	Description.	Rate.	Amount.	Signature.	Allocation.	
					Capital.	Revenue.

Summary of Allocation.

Capital.		Revenue.	
Account to be debited.	Amount.	Account to be debited.	Amount.

Salaries Pay Bill for month of.....19 .

Name.	Description.	Rate.	Amount.	Signature.	Allocation.	
					Capital.	Revenue.

Summary of Allocation.

	Capital.		Revenue.	
	A/c to be debited.	Amount.	A/c to be debited.	Amount.

It is desirable to have certified statements describing the work done, and charged to capital, in regard to wages and salaries, and stores.

Summary of Capital Expenditure for the Month of.....19 .

Description of work.	Details.	Stores.		Wages.	Salaries.	(Other expenses to be specified.)	Total.
		Old.	New.				
Total for month brought forward.							
Total to date.							

Capital Expenditure and Subscribers, Month of.....19 .

New subscribers.		Withdrawals.		Net increase.		Capital Expenditure.	Cost per subscriber.	% of increased revenue on capital outlay.	Remarks.
No.	Amount.	No.	Amount.	No.	Amount.				

The bulk of the purchases of machinery, materials and stores, including telephones, wires, &c., are usually effected by the London office upon requisitions by the local office (which deals with minor requirements locally), invoices being sent by the suppliers to both offices. In the London office the amounts of the invoices are credited by journal entry to the suppliers, and debited to the local office or remittance account. In the local office the invoices received by way of London office are entered in a Purchase Book, and monthly, or at some other uniform period, are credited to London office or remittance account, and debited to stock and other accounts to which they relate, being converted into currency at the par rate. The balance of the local office in the London books should, of course, always agree with the reverse balance of the London office account in the local books, these two accounts representing the transactions and accounting entries that are necessary for the purpose of agreement between the two offices. The local purchases are, of course, in the local currency, and are entered in a Local Purchase Book, which is kept in the same way as the Invoices from London Book.

(*To be continued.*)

BUSINESS NOTES.

American Comments on Foreign Markets.—Russia.—The American Consul-General at Moscow, in the course of an interesting report on wood-working machinery in Russia, makes some observations which are worthy of study from the British electrical and engineering point of view. He says that the leaders in the sale of sawmills and wood-working machinery and hand tools are the Germans, who now have a genuine monopoly of the trade, due to their being pioneers in exporting to Russia, their energy and persistence, to their close application in studying the wants and needs of the people, and to their familiarity with the language.

German travelling salesmen usually speak three to four languages, having served what might be termed an apprenticeship of two or more years in some Russian village where it is impossible to hear any tongue except the vernacular. These salesmen are then perfectly at home in any part of the Empire, and understand the Russia character better than any competitor.

In contradistinction to this thoroughness of preparation on the part of the Germans is the unpreparedness of the American travelling salesman, who comes to Russia speaking usually only his mother tongue, possessing slight familiarity with the geography of the country, and having little knowledge of the requirements of the people. It is little wonder that the Germans are actually capturing the larger part of the great and growing trade of Russia.

During the past year the English have become more active in business lines and are branching out in earnest in every part of the Empire, fully understanding that immediate efforts must be made to hold and build up their trade or it will be lost to the watchful and energetic Teutons.

Some time ago the representative of a large American sawmill machinery company visited Russia, and called at the Consulate-General to discuss the trade situation. He could speak only English, but had with him an interpreter, who was well acquainted with Moscow. The salesman was a keen business man, and at home, undoubtedly, was familiar with his line ; but he took issue at once upon the prevailing customs of Russia as to credits, and stated positively that his concern was not in the credit business, and that, instead of accepting this fixed rule of trade, it was his intention to teach those whom he might meet American methods ; that is to say, cash with a view to taking advantage of the discounts offered.

"The American salesman visited a large number of dealers, and before leaving called again. This time his manner was changed, for he had seen for himself how futile it is to try to introduce new ideas in a country where they have their own set ways ; the traveller coincided with the views that had been expressed by voice and letter, that if the American manufacturers of saws and machinery expect to get a foothold here, they must at least make as many concessions in terms of payment and the like as their strongest competitors, and they must, in addition, supply a superior article, which it is believed they can do. The traveller remarked that he could not secure an opening with a desirable house in Moscow except on the credit basis.

"This illustration is offered for the purpose of bringing forcibly to the attention of the American exporter the necessity for a close study of every phase of business life in Russia, and of the trade requirements, in order that they may successfully compete in the various markets being opened."

Barbados.—In the course of an American Consular report the following interesting paragraph appears :—

"Labourers in Barbados earn 30 to 40 cents per day at farm work, the women getting half as much. They wear cotton clothing the year round, shoes a small part of the time only. The cloth for making the garments of the labouring classes comes largely from England ; one reason given is that it has been coming from there, is good and cheap, and there is no reason for changing. The same reason is given why candles and lamps are in general use on the island, not even the largest city being lighted by electricity, gas

being used, and there is not an electric light plant on the island, unless it is some small private one."

As to transportation methods, there is a plentiful supply of carriages, and a mule tramway, which runs half-hourly cars and charges 8 cents for a two-mile ride. The cars are small, cheap affairs, seating 20 to 24 people, and a person can spend a short half-hour comfortably in going two miles on the single-track road, for one has a chance to visit his neighbours at the switches. The Consul adds:—

"There is a chance for some enterprising firm to electrify the tramway in Bridgetown and extend it. With reduced fares for distance riding, the possibilities are excellent, but coal will have to be imported to produce the power, unless oil can be found on the island, and this seems hardly probable, as the island is entirely of coral formation, and seems to be one large filter."

Switzerland.—An American Consul at Basle says:—"Here, as elsewhere, the larger establishments have changed the old traditional aspect of the smithy by the introduction of electrical force. An electric current impelling the air through a tube under the coal of the forge has taken the place of the familiar bellows. It is even said to be difficult in these times to find men willing to work with the old apparatus. Electricity is used to drive the boring and grinding machines."

Bohemia.—A Prague Consul (American) also alludes to the present character of blacksmith shops in Bohemia:—"The interiors are generally equipped in about the same manner as American shops, with one fire or more, according to the requirements, with anvil and hand or power drills, the latter operated by benzine, water or electric motors. Besides these, there are the usual sledges, hammers, dies, tongs, knives, rasps, files, saws, bolts, nuts, drawknives, &c. In the larger shops the blower under the fire is operated by an electric motor instead of using the old-fashioned bellows, and they are also equipped with devices for forcing together the heated ends of iron or steel tires when welding, instead of welding on an anvil with sledges."

Consular Notes.—China.—The British Consul at Kiungchow reports that the wireless installation there, as it exists at present, is so frequently out of action that it is of very little use either for typhoon warnings or commercial purposes. Remonstrances made to the provincial authorities have, it is true, brought about the construction of a new landline on the mainland between Hsu-Wen and Canton, but the former station, which is but 14 miles distant across the Hainan Straits from Hoihow, and the Hoihow installation itself, are alternately out of order, and the erection of the new line has been of little benefit. Typhoon warnings telegraphed from Hong Kong or Haiphong invariably arrive some days after the typhoon has passed, and the absence of timely warnings is a menace to safety. It would not be a matter of great expense to increase the radius of the Hoihow telegraphic installation, so as to establish direct communication with Canton, and, perhaps, with Manila, and this done, the transfer of the useless installation at present at Hsu-Wen to Yaichou, in the extreme south of Hainan, would be a commercial improvement and a strategic benefit to the Chinese Government.

The British Consul at Swatow reports that the Swatow Electric Light Co. having been reconstituted with a capital of about $175,000, has now completed its buildings, and the plant is in working order, giving satisfactory results to the community. Inquiries have been made with a view to the extension of the telegraph line from Chao Chow Fu to Kia Ying Chow, a distance of 40 miles.

The British Commercial Attaché at Pekin reports that the import returns under the headings of electrical materials, machinery and railway plant show that the expectations of increase expressed in last year's report have failed to be realised—indeed, the values of the first two items are considerably reduced. Progress, however, continues to be made throughout the Empire in undertakings requiring machinery. During the year 1909, electric lighting contracts were given out for new installations at Chungking, Chengtu, Changsha, Nanking and Ningpo, and for more or less important extensions at Shanghai (settlements and native city), Hankow, Pekin, Swatow, Mukden and other places. Negotiations were going on at the beginning of 1910 for a large installation at Hangchow and for installations in several cities in Manchuria; indeed, there may be said to be an electric lighting project in every city in China, although at Pakhoi the project is stated to have been abandoned in view of the successful introduction of incandescent mantles. The only difficulty is to find funds for carrying such projects into execution. Almost all contracts require to be financed by the contractors, and British firms finding British manufacturers unwilling to supply plant, except for cash down, have sometimes co-operated with German firms, the latter arranging the finance in return for being allowed to participate. Thus several of the contracts mentioned above are for British engines and boilers, and for German dynamos. Payment is generally spread over a period of two or three years on proper security being given. In further illustration of progress in electrical works it may be mentioned that an electric tramway scheme for Canton is under contemplation, that a considerable extension of the telephone system in that city has been carried out recently, and that preparations are being made for inaugurating telephone services at Chengtu, at Wuhu, and in the provinces of Kiangsi and Chekiang.

The Board of Communications claims that all the private shares in the Imperial Chinese Telegraphs have now been redeemed, and that the administration is completely under Government control, partly Imperial and partly provincial. Extensions of this system continue to be made, the most important effected during 1909 being the direct Peking-Hankow line along the railway, on which fast automatic Wheatstone working has been established. The following statistics for 1909 have been supplied by the Administration:—Length of aerial line, 40,730 km.; submarine lines, 1,772 km.; underground lines, 6 km.; aerial wire, 67,282 km.; submarine wire, 1,772 km.; underground wire, 165 km.; offices, 528; head-office staff, 112; general staff, 3,473; line staff, 2,833; instruments in use, 1,171 (of which 22 are Wheatstone automatic and 5 wireless); telegrams handled, 807,841; receipts, $838,733; expenditure, $479,816.

A reduction of telegraph charges by 20 per cent. was effected in 1909. The programme of the Board of Communications for the nine years preceding the establishment of constitutional Government (1908-16) includes for each year the improvement and extension of the telephone system throughout the country, and for 1911, preparations for installing wireless telegraphy along the coast.

Brazil.—The British Consul at Porto Alegre reports that since the electrification of the Porto Alegre tramways was effected, the Brazilian company, called the Companhia Forca e Luz, found it necessary to double a portion of their lines owing to the increased traffic. They have contracted with a British firm, who also carried out the work of electrification of the tramways formerly worked by mules, for the installation of electric lighting and power supply in the city for private consumption. This installation will be of the most modern description, being underground, and will compete with the present lighting company and the municipality.

Turkey.—The British Consul at Erzeroum reports that the greater number of business circulars received at the Consulate relate to electrical appliances, motors, bioscopes, machinery, plant, &c., for all of which branches there is not and probably will not be any opening for years to come, as the mass of the population, both in the country and in the towns, is still too undeveloped to have any but the most elementary wants.

Russia.—The British Consul at Archangel reports that the Lapland telegraph extends to Alexandrovsk, whence there is a private telephone to Vardo. Telegrams between the two places have still to go round the circuitous route Archangel-St. Petersburg-Scandinavia. A line of telegraph to Pustozersk on the Pechora for observation purposes, voted by the Government, has been in abeyance since the war. Wood was cut for poles, but money for completion has not been available.

A scheme for establishing an electric tramway is under serious consideration, but a 50 years' concession has been refused by the municipality, and a shorter one might not prove advantageous. Sleighs in winter are much cheaper than cabs in summer, and this and the length of tramline required compared with the small population per mile would scarcely allow of the scheme paying. A few years ago the town was provided with a water supply, and the principal streets are now lighted by electricity.

Book Notices.—*The Apprentices' Course of Experimental Physics and Mechanics.* By J. L. Maxim, B.Sc. London: Longmans, Green & Co. Price 1s. 6d. net.—This book is designed to meet the requirements of the preliminary technical examinations of the Lancs. and Cheshire Union of Institutes and other technical educational authorities. It deals with mensuration, densities, mechanics and heat, and contains full instructions for the student, with clear illustrations. Test papers are provided at the end of each section, as well as recent examination questions on the whole. It appears to be a capital little course of lessons of a very practical nature.

The Indicator Handbook. By C. N. Pickworth. Part I. Manchester: Emmott & Co. Price 3s. net.—This is one of those books which have become classics, and need no recommendation; its continued popularity vouches for its excellence. The present is the fourth edition, and has been entirely re-set in new type, with extensions and revision. A special chapter has been added to deal with the indicators and reducing gears used with gas and oil engines, and various new types of indicators have been included. The book is well printed, and the illustrations are excellent.

A new British technical journal entitled "Woodcraft" was issued last month; it is intended to provide for the needs of the wood-working industry, and having been for a long time established in the United States, it possesses already an intimate acquaintance with those requirements. We have no doubt, therefore, that it will readily gain a footing in this country, and we wish it success in its new venture. The address from which it is published is 22, Henrietta Street, Covent Garden, London, W.C.

The Official Circular of the Tramways and Light Railways Association for October contains a translation from Herr Busse's report to the International Tramways Congress on rail corrugation, and an article on the same subject by Mr. J. H. M. Andrews, assistant to chief engineer, Philadelphia Rapid Transit Co.

"*Journal* of the Institution of Electrical Engineers." September, 1910, with Index to Vol. 45, and List of Officers and Members corrected to August 31st, 1910. London: E. & F. N. Spon, Ltd. The issue for September contains the following: "Earthed *v.* Insulated Neutrals in Colliery Installations," by W. W. Wood; "A Telephone Relay," by S. G. Brown; "Standardisation of Fuses," by H. W. Kefford; "Isolated Electrical Plants," by R. C. Plowman; "Current Transformers," by A. P. Young; "Collection of Current at High Peripheral Speeds," by P. J. Cottle and J. A. Rutherford; "The High-Tension Spark Discharge in Air," by P. Kemp and W. A. Stephens; "Breaks in Submarine Cables," by W. H. Young; "The Static Balancer," by C. C. Hawkins; Report of the Council for the year 1909-10; Annual Accounts; Special General Meeting of Members; Obituary Notices.

"*Journal* of the Franklin Institute." Vol. CLXX, No. 4, October, 1910. Philadelphia: The Institute. Price 50 cents.

"*Journal* of the United States Artillery, with Index to Current Military Literature." Vol. 34, No. 2. September, 1910. Fort Monroe, Va.: The Coast Artillery School Press.

"How to Use the Electric Light with Economy." By F. H. Taylor. 1910. London: Percival Marshall & Co. Price 6d. net.

"The Care and Management of Ignition Accumulators." By Harold H. U. Cross. 1910. London: E. and F. N. Spon, Ltd. Price 1s. 6d. net.

"English Prices with Spanish Equivalents." By S. Lambert. 1910. London: E. & F. N. Spon, Ltd. Price 1s. net.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXIX, No. 10, October, 1910. New York: The Institute. Price $1·00.

We have received a copy of the first number of the European edition of *Castings*, an American journal of foundary practice. It is published monthly (7½d. net) by Page's Publishing Co., Ltd., 22, Henrietta Street, London, W.C.

Railway Station Lighting.—Mayfield Street Station, Manchester—newly built by the London and North-Western Railway Co. to deal with local traffic—is brilliantly illuminated by Osram lamps. The platforms are lighted throughout by 36 400-C.P. 200-volt lamps. These are arranged in fittings which have been supplied by the GENERAL ELECTRIC CO., LTD., hung on chains from girders, 15 ft. from the bottom of the globe of fitting to the ground, and arranged 60 ft. apart. The work has, we understand, been carried out by MESSRS. COLLIER & CO., Manchester. We have received a photographic reproduction of the station as it appears at night-time, and it certainly seems to be well lighted.

Bankruptcy Proceedings.—H. K. P. BARHAM (trading as the South of England Electrical Engineering Co.), electrical engineer, 60, Fratton Road, Portsmouth, Hants.—This debtor applied at the Court House, St. Thomas's Street, Portsmouth, on October 13th for his discharge from bankruptcy, The liabilities to rank for dividend were estimated at £357, but the amount lodged and proved was actually £358, but the assets, so far as not assigned to creditors, wholly or partly secured, produced only £30, so that no dividend could be paid, the assets having been insufficient by about £110 for the payment in full of even the preferred creditors. The Official Receiver reported that the debtor had been in business on his own account at 60, Fratton Road, having started with a capital of £90, £40 of which he had saved, £50 being given to him by his father. The debtor stated that he had been hampered by lack of capital, and he had made several arrangements with his creditors from time to time, and at quite an early stage of his trading his father paid for him a composition of 10s. in the £ on liabilities amounting to between £30 and £40. About four years before his failure the debtor obtained an administration order in that Court, under which 5s. in the £ was paid on about £40, and at the date of the Receiving Order the debtor was making application for an administration order, and there was on the files of the Court a statement, which he had sworn, that his debts did not exceed £50, whereas, in the statement of affairs filed in the bankruptcy, the liabilities were scheduled at £414. The debtor had spent several hundreds of pounds in connection with a patent, but his ordinary business had never paid sufficient profit to maintain him and his family, and he had been living on his father, and had borrowed from his friends, for the purposes of speculation, which, to a considerable extent, appeared to have been responsible for his present position. He alleged that losses on contracts was one cause of his failure, but those losses appeared to have been very small, and all have resulted from bad workmanship. The preferred claims were in respect to premiums paid by six premiums paid by six apprentices, who, for a considerable time, were the only workmen in the debtor's employ. There had been the usual statutory offences, and in his examination the debtor admitted that he had removed his goods to conceal them from his creditors. His Honour suspended the discharge for two years.

W. H. HUNTER, plumber and electrician, Towyn.—First meeting and public examination, October 25th, at Town Hall, Aberystwyth.

Prices of Rubber Tapes and Solution Reduced.—MESSRS. SIEMENS BROS & CO., LTD., announce that the net prices for their india-rubber tapes and solution (in Catalogue No. 510 and Reprint No. 510A), which came into force on April 8th last, have been reduced by 20 per cent. as from Monday, 17th inst.

Clement Bayard Dirigible.—We are informed by ACCUMULATOR INDUSTRIES, LTD., that the "Leitner" system of automatic electric lighting, is installed on this big airship, the first of its kind to cross the Channel.

Liquidation.—UNIVERSAL MOTOR IMPORTS, LTD.—Mr. Justice Neville, in the Companies' Winding-Up Court, had before him on Tuesday last a petition by the Packard Electric Co. for the compulsory winding up of this company. Mr. Boome, in support of the petition, stated that the petitioners were creditors for £109, and there was no opposition. His Lordship made the usual order.

Trade Announcements.—THE PROVINCIAL ELECTRIC LAMP CO. have opened premises at 253, Eccleshall Road, Sheffield. Manufacturers' catalogues and lists are wanted.

MESSRS. E. BROOK, LTD., of Colne Road Huddersfield, report that a further extension of trade has compelled them to take a portion of Britannia Mills, which adjoins their building, on a long lease. This consists of two floors, each room being 200 ft. × 50 ft. The lower one has been fitted up with the latest and most improved grinding machinery, so that no grit or dirt is thrown on to the more delicate machines which are fixed in the large machine shop. The first floor has been fitted up with the winding stands for winding the stators of Brook alternating-current motors. The firm have 12 stands in use at present, and each stand is worked by two hands. This extension has been necessary owing to the congestion in the main works, which, we understand, is due to the popularity of their new type of ball-bearing motors.

THE ROCHDALE ELECTRIC CO., LTD., are removing their head office from Shawclough to the centre of Rochdale, where they have taken more commodious premises, and where they are fitting up a showroom dealing with electric lighting, heating, cooking, ventilating and power. The new premises, situate at 13, Drake Street, Rochdale, are expected to be opened by November 1st.

THE ELECTRICAL APPARATUS CO., LTD., have acquired a large freehold site at Vauxhall, on which they are proceeding to erect extensive works, having about 10 times their present capacity, and fitted with the most modern automatic and labour-saving machinery. This course has been taken by the directors on account of the large increase in their business in E.A.C. high torque meters, motor-control gear and Koolark fuses during the last 12 months. Pending the completion of the new works, however, there will continue to be prompt execution of orders, as overtime will be worked continuously.

Exhibition Awards.—MESSRS. ANDRE CITROEN & CO., makers of machine-cut helical gears, inform us that at the Brussels International Exhibition their various exhibits in the Belgian, French and French Colonies' sections have been awarded three Grand Prix.

Holophane Reflectors.—We are informed that the ill-fated dirigible *America*, in which Mr. Wellman attempted to cross the Atlantic, was equipped throughout with Holophane steel reflectors.

Trade Outlook in Turkey.—Mr. Consul Waugh, of Constantinople, points out that commercial organisation is necessary, the British manufacturer apparently not realising that single-handed he fights at a disadvantage against better organised foreign industries. Turkey is a neutral market in which all goods compete on equal terms; most of the articles ordered by the Ottoman War Office are not made in the country, and as many of the orders must be repeated, the market is certainly worth attention. There is a good field for organised effort to sell British goods in Turkey, and the time to begin is now, when the country is slowly waking. Manchester's efforts to produce the cotton flannelettes so much used all over Turkey are meeting with success, but there is room for more active pushing of British goods. With regard to the wide-spread impression in some commercial circles in the United Kingdom that the Levant trade is unsound and better left alone, Mr. Waugh says it is not an easy market, but with proper care and reliable agents there is no reason why undue risks should be incurred. A careful and energetic agent is not always easy to find, but the Consulate-General is willing to assist in doing so. We are glad to see that the number of business men from the United Kingdom who visit Constantinople is steadily increasing, and that, so far as individual effort goes, more interest is being shown in the Turkish market. Undoubtedly, however, what is wanted is combined effort. It is, says Mr. Waugh, to the superiority of co-operation and commercial organisation over individual action that it seems so necessary to call the special attention of the business world in the United Kingdom. This course is, it will be remembered, strongly advocated by Sir Adam Block, president of the British Chamber of Commerce of Turkey.—*The Chamber of Commerce Journal.*

Catalogues and Lists.—MESSRS. ESCHER, WYSS AND CO., LTD., 109, Victoria Street, Westminster, London, S.W.—A 32-page finely illustrated brochure has been issued describing the Brusio hydro-electric power station at Campocologno, Grison, Switzerland. Excellent photo-process views of the power station, pipe lines and turbines, appear, also line drawings of the buildings and plant. The description is very full, and is in English. Two other similar publications, just issued by the firm, are as follows:—A 36-page catalogue, in three languages—English, German and French—containing a list of Francis turbines in closed casing, ordered between 1901 and June, 1910. This tabulated list occupies alternate pages, and is accompanied on facing pages with half-tone and line diagrams illustrating some of these installations. There follows a table of some results obtained during brake tests made with these turbines. The other is a 28-page pamphlet detailing and showing in a similar manner tangential wheels ordered from the firm between January, 1901, and May, 1908, and tabulating results of tests.

ALLGEMEINE ELEKTRICITATS GES., Berlin, N.W.—We have received from the A.E.G. pamphlet No. X 187, dealing with vertical motors for driving centrifugal pumps, showing various arrangements of the motors for stationary and portable purposes, shaft-sinking, &c., together with cables and controllers, and particulars of installations already carried out. Some of the latter are upwards of 700 H.P. Up to July last 171 such motors had been supplied, of 25,376 H.P. in all. Brochure No. 8 gives particulars of A.E.G. dynamos coupled to petrol, alcohol and oil engines.

MESSRS. GALSWORTHY, LTD., 15 and 16, Newman Street, London, W.—Leaflets giving prices of the "Mascot" metallic-filament lamps, and "Metaflect" lamps, also designs of some fittings for the latter reflector lamps. The firm are London representatives of the Wandsworth Electrical Manufacturing Co., Ltd., whose illustrated and priced catalogue of 56 pages relating to various electric fittings, switches and accessories, they have also placed before us.

MESSRS. M. C. SHEPHERD & CO., 60, Queen Victoria Street, E.C.—Price list of "A.P.W." quick-revolution paraffin, petrol and gas engines, British made, for country-house and yacht lighting and power plant, in sizes from 1 to 3 B.H.P., coupled to dynamos or separately, as desired.

The United Flexible Metallic Tubing Co., Ltd., Ponder's End.—40-page illustrated pamphlet, giving very full information regarding their flexible metallic tubing for several classes of service.

The Adams Manufacturing Co., Ltd., Bedford.—Four-page list describing the latest developments in "Igranic" motor-starting switches, A.C., two and three-phase.

The Business Exhibition at Olympia.—This exhibition is to close to-morrow (Saturday) night. Any of our readers who may be visiting it between now and then will, as usual, find a variety of typewriters, filing systems, addressing machines and other office paraphernalia, but they will be particularly interested in the exhibit of Electrical Installations, Ltd. This firm have shown great enterprise in making so large and effective an everything-electrical demonstration—just the class of exhibit to appeal to business men who, in their study to improve the efficiency and comfort of the modern office, are ready to take advantage of every device which will give better lighting and heating and will at the same time provide means for preventing waste of electricity. Part of the stand is set apart in two compartments for showing the difference in illuminating effect with and without Holophane globes. On the stand itself there is a varied collection of electric heating and cooking apparatus, portable ozonising apparatus, all kinds of lamps, the Watkin switch—the economical properties of which catch your eye at once as the lamp turns down in stages as you approach. We are sure that this exhibit will well repay the firm for the trouble and expense that they have borne in the matter. One of their objects is to get the consumer into touch with their maintenance scheme for electrical installations. In another part of the hall will be found an exhibit of the Polychrome electric sign switch by the Multi-Colour Switch Co., of Notting Hill Gate. The standard design of this device is able to carry 10 amperes, with eight consecutive changes. Messrs. Dobbie & Dobbie, of Edinburgh, have an interesting exhibit, where models and large sectional drawings are shown of certain patented improvements in tramway construction. These consist of new anchor bars and paving blocks, by means of which, we were informed, very considerable economies in permanent way renewal expenditure are possible. We may allude to these in a later issue, but tramway managers interested can obtain literature giving particulars direct from the firm by writing for it. As one enters Olympia, on the left hand is an exhibit of the Synchronome Co., from which one can learn the great progress that this firm is making.

Electrolytic Disinfectant.—Since December last the plant installed by Dr. Alexander, at Poplar, has turned out nearly twice as much disinfecting fluid as in the corresponding period of last year, the output for eight months being 33,478 gallons; during June, July and August the output per month averaged over 6,600 gallons. The cost of material was: electricity, 4,573 units at 1½d., £28 11s. 7d.; chloride of magnesium, 3⅝ tons, £14 12s. 11d.; salt, 7 tons, £11 18s.; caustic soda, £6 5s.; water, £1; total, £62 7s. 6d. Bottles, corks and labels cost £24 10s. 6d. The fluid was regularly used in the swimming baths, giving continued satisfaction, and it is being experimentally used for spraying and cleaning the floors of six L.C.C. schools to ascertain whether the health and attendance of the children will be appreciably improved thereby.

Big Canadian Exhibition.—According to the *Times* correspondent at Ottawa, the citizens of Winnipeg have already subscribed £500,000 toward the World's Exposition that they want to hold there in 1914. The Dominion Government has been asked to contribute a like amount.

The Electrical Contractors' Association (Inc.).—A meeting of members of this Association is to be held at Frascati's Restaurant, Oxford Street, W., on Tuesday, November 1st, at three o'clock, when a discussion will take place on a paper by Mr. Ratcliff on "Means to be Taken to Increase the Status and Efficiency of our Association."

"Efesca" Lamps.—In the height of the lighting season, when lamps are in great demand, the manufacturer who can hold large stocks is at an advantage. The great variety of voltages and candle-powers which are used in this country necessitates a stock of large proportions to enable prompt delivery to be given. In this connection we understand that Messrs. Falk, Stadelmann and Co., Ltd., claim to be in a unique position as regards their facilities for giving immediate delivery of all standard voltages and candle-powers in any quantity which is likely to be required, having accumulated during the summer months, when the works were quiet, a huge stock of Efesca metal-filament lamps of all voltages and candle-powers. They are also carrying out a vigorous advertising campaign in these lamps. The firm supplies attractive literature with customers' own names on, also showcards and novelties for contractors' shop windows.

LIGHTING and POWER NOTES.

Acton.—The Acton Council of Public Welfare has decided to summon a town's meeting for the 31st inst., to consider what action shall be taken in view of the decision of the Council to sell the electricity undertaking to the Metropolitan Electric Supply Co.

Barnes.—The following scale of discounts on power charges has been approved:—On a consumption of 500 units per month, 10 per cent.; 750 units per month, 20 per cent.; 1,000 units per month, 33⅓ per cent. Mains are to be extended at an estimated cost of £416.

Bath.—The T.C. has been granted by the B. of T. an order extending the area of supply for electricity to a radius of three miles from the Guildhall. This area includes part of the district of the R.D.C., who supported the application.

Bingley (Yorks.).—The Finance Committee of the Council on Monday recommended an application, under the Yorkshire Electric Power Act, to the B. of T. for the cessor of the powers of the company so far as they relate to the Bingley district. It was decided to approve the recommendation. Subsequently a member asked why no report was presented by the Sub-Committee appointed at the last meeting to inquire into the desirability of Bingley providing a supply of electricity, and it was stated that the Committee had come to certain conclusions, and was prepared to give a report to the Council in committee.

Birmingham.—During the past week the second chimney at the Summer Lane power station had been completed, the Lord Mayor laying the last brick at the summit. This chimney is required in connection with the plant extensions which are being made. Four years ago the station was opened with plant of 8,500 KW. capacity; the plant now installed amounts to 19,000 KW., and some 5,000 H.P. per annum is being added. The King's Norton Council has agreed to the Greater Birmingham scheme on condition that the city carries out the local supply order.

Bognor.—The U.D.C., as the result of a report from an expert, proposes to apply to the B. of T. for a prov. order for E.L. The Chichester E.L. Co. has intimated its intention of applying for similar powers.

Bury St. Edmund's.—The T.C. has received from the L.G.B. sanction to a loan of £1,133 for additional plant at the electricity works, and £330 for the laying of a larger main.

Chile.—A concession has just been granted by the municipal authorities of Linaies, Chile, for the establishment of a central station in the town for electric lighting and power purposes.

Cirencester.—Mr. J. H. Edwards, of Bristol, has asked the U.D.C. to support him in his application for a prov. order for E.L. The Council has referred the matter to the Streets Committee for consideration.

Clacton-on-Sea.—The U.D.C. has decided to give moral support to the Bill of the I.M.E.A. seeking powers to enable local authorities to supply lamps, fittings, &c., and to undertake wiring work.

Continental Notes.—France.—According to investigations made by M. Wilhelm, engineer-in-chief to the Ministrie des Ponts et Chaussées, the estimated water-power derivable from the River Durance and its feeders amounts to about 500,000 H.P. Of this total, only 76,000 H.P. is at present utilised, while stations under construction will absorb 16,000 H.P., and projected undertakings, over 100,000 H.P. A balance of some 200,000 H.P. therefore still remains for appropriation. The Durance has a length of 272 km., rises near Briançon, and falls into the Rhone near Avignon. On account of its steep course, its flow is torrential, while it affords numerous falls, ranging from 7 to 400 metres in height. The stations existing or projected number 19.

A new company has lately been formed in Douai, with a capital of £32,000, and the title La Société d'Eclairage et Force Motrice par Electricité.

La Société Hydro-Electrique de Lyon is the name of a new company which has just been formed in Paris (38, Rue St. Georges), with a capital of £160,000.

Last week, as was expected, a portion of the electric supply in Paris was cut off, owing to a strike of the electricians, who sympathised with the railway men. The cessation of supply also stopped the tramways on the Boulevard Montparnasse.

Switzerland.—Some recently published official statistics show the extent of Switzerland's electric resources, both actual and potential. The total number of existing electric stations is 49, of which 14 are situated in the basin of the Rhone, having a total capacity of 78,700 KW., and capable of being increased to 171,700 KW.; 28 in the basin of the Rhine, with a total present capacity of 172,500 KW., but able to be augmented by 55,000 KW.; seven in the basin of the Po, with a total of 46,600 KW., capable of extension to 64,000 KW. The aggregate of these figures gives a total of 297,000 KW., capable of increase to 463,000 KW. These totals are exclusive of the numerous utilisable powers in the Tessin, Grisons, Valais and Berne districts. Of the 49 stations, the largest are that at Laufenberg, with a capacity of 21,000 KW.; Biaschina (Tessin), 21,000 KW.; Löntsch, 16,000 KW.; and Beznan, 14,000 KW. A part of this power is utilised by the railways, eight normal gauge lines of which are worked by electric traction; their length is 143 km., a small proportion only of the 3,450 km. comprising the whole Swiss system. There are also 36 narrow-gauge lines electrically worked, mostly mountain lines of purely local interest, their extent being 218 km.

Turkey.—The decision come to in the matter of the tenders sent in for the electric lighting of Constantinople is in favour of the scheme of the firm of Ganz, of Budapest, to which certain technical and commercial modifications have been suggested by French groups. If these are accepted, the Stamboul Gas Co. will be

bought up, whereby it will become possible to install the electric light not only in the Stamboul district, but also in those of Pera and Galata. The concessionaire has entered into an alliance with two French groups—the firm of Giros et Louchenr and the Société Havraise, whose agents at Constantinople are Messrs. Toucquiau et Jules Warnant. It is intended to buy out the shareholders of the Stamboul Gas Co.

Dublin.—The Pembroke township has received the sanction of the L.G.B. for a proposed loan of about £35,000 for certain improvements, of which sum, £6,000 will be devoted to electric lighting and £8,000 to extensions.

Donaghadee.—A special meeting of the Council was held on the 12th inst., for the purpose of considering the advisability of adopting a scheme of electric lighting under municipal control, or of the Council permitting a limited liability company (as has been suggested by a firm of Dublin engineers) to secure powers for the purpose. The town clerk (Mr. D. Walker) submitted correspondence favourable towards the adoption of electricity. Mr. Pegg, of the firm of Miller, Wilson and Pegg, appeared before the Council and made a statement as to the practibility of an electric lighting scheme and the chances of the success of such an undertaking, pointing out that the Board of Trade were inclined always in granting a provisional order for the purpose to favour the control of lighting being in the hands of the local authority. He mentioned also that the plant for generating at the electric station might with advantage be utilised in the daytime for pumping purposes in connection with the proposed water supply for the town. Correspondence was submitted from Messrs. Wilkins & Burden on the matter, this firm intimating that if the Council did not intend to proceed for a provisional order a limited liability company would be prepared to take the matter up. After considerable discussion, it was decided (with one dissentient) that a special meeting of the Council be held on November 15th next for the purpose of proceeding for a memorial to obtain a provisional order of the Board of Trade for electric lighting purposes (public and private), that the solicitor be asked to make the necessary arrangements, and that the two firms above-mentioned be asked to submit their terms for acting in the matter.

Dundalk.—The L.G.B. has sanctioned the Council obtaining a loan of £20,000 for the purpose of installing electric lighting plant in that town.

Dundee.—At a special meeting of the T.C. held on Friday last, a request from the M.E.A. for the Council's support to their overtures to obtain power to undertake wiring, motor hiring, &c., was considered. Mr. Wm. Don, convener of the Electricity Committee, said but for the fear that the electrical contractors in the district might be in any way injured or hampered in their work, the Council would have agreed to the request practically unanimously. They had had a meeting with these contractors, and the only serious objection raised was in connection with the wiring. Bailie Reid, in seconding, said the question was whether they were to continue in municipal trading to the extent of enabling the Electricity Department to carry on its business. The Gas Department had made great strides since it got powers to go in for municipal trading. He could not see any reason why the Electricity Department should be hampered and hindered in the development of the industry simply to suit the convenience of some of the private traders. Mr. Harry Richardson, the engineer, said he was indifferent about the wiring clause, because he did not see how the fact of the department doing actual wiring could possibly benefit the department. He was glad of the opportunity of saying that, if it was to have any tendency to withdraw the objections, which he must say were greatly imaginary, on the part of the local contractors. On a division an amendment to support the proposal without the wiring clause was carried by 12 votes to 7.

Dyffryn (Wales).—The Improvements Committee has called a public meeting to consider the question of lighting the district with electricity.

Ealing.—During the past year the consumers of the electricity undertaking have increased by 330 and 8,900 more 8-c.p. lamps have been connected. Alderman Peal (chairman of the Committee), in making his annual statement at the last meeting of the Council, said that the gross profit for the year had been £14,516, while the net profit was £2,005. Their profits, however, last year had been somewhat abnormal, as, he said, they had then the use of a lot of machinery without paying the full interest charges, This year they would have to pay £1,100 more in interest.

Edinburgh.—In a memorandum issued to the members of the T.C. by Treasurer Leishman with regard to special aspects of the finance of the city, it is stated that the amount received from the electric lighting account this year is £2,182, and the total received from this source since 1897 has been £49,241. The treasurer is of opinion that it is an open question whether a system of indirect taxation, which bears on a small number of consumers of electric light, is justifiable in itself and fair to the electric light undertaking and its consumers.

During the past year, 1,229 arc lamps have been in use for street lighting, at an annual cost of £9 per lamp.

Enniskillen.—The Council is presently interested in a lighting scheme and has been in communication with a Dublin firm as to the best means of putting the project into force, financially and otherwise. The Council has expressed its willingness to facilitate the firm referred to, in the erection of works, overhead wires and the carrying out of the scheme generally.

Gillingham (Kent).—The T.C. has applied to the L.G.B. for a loan of £3,500 for E.L. purposes.

Gravesend.—The T.C. has decided to extend the mains so as to give a supply to the factory of the Imperial Paper Works Co., Ltd.

Great Yarmouth.—A L.G.B. inquiry was held on October 11th relative to the application of the T.C. for a loan of £5,800 for electricity purposes, £1,550 for public lighting, £750 for a cooling tower, and £3,500 for mains. There was no opposition.

Horsham.—The U.D.C. has decided to apply for a loan of £1,850 for electric light purposes.

Irlam.—The D.C. has discussed proposals for acquiring rights for the lighting of the district and the provision of electric tramways, it being unanimously resolved that the Council send a deputation to the Salford Corporation to urge both schemes, in view of the rapid extension of the district.

Kinross.—At a meeting of the T.C., a proposal to light the streets by electric light was considered, and a deputation was appointed to meet Colonel Porteous, of Turfhills, as to terms for ground on which to erect the necessary plant.

Launceston.—The E.L. order of 1903 has been revoked by the B. of T.

Liverpool.—The year's review shows that the mileage of electrically-illuminated streets has increased from 5¼ to 6¼. The turbines at the Lister Drive power station turned out 35 million units at a cost for oil alone of £900, as against £2,700 for 23 million units by the old steam plant.

London.—Holborn.—At the last meeting of the B.C., a deputation submitted a petition signed by 2,671 ratepayers protesting against the contract for the street lighting of the borough being given to the Gas Light and Coke Co. for 10 years without competition. Mr. A. W. Gamage, who acted as spokesman of the deputation, said that he had no interest in any electric light or gas company, and was only there as a large ratepayer who was much interested in this question. His company spent £3,000 a year on electric light, and it was most desirable, in his opinion, from the traders' point of view, that the streets should be well lighted, as where they had light they were bound to get the public. This borough had four electric supply companies within its area, and as a business proposition he submitted that it was not wise to give a large contract to the gas company without getting schemes and prices from the electricity people. He had visited the principal commercial cities of the world, and in his opinion, Holborn was far behind, even the smallest of them, as regards the lighting of the streets. They had only to contrast their borough with Oxford Street; it was like stepping from darkness into sunshine. The Mayor said that they had not given the contract to the Gas Co. for any number of years. Mr. Gamage said he was under the impression that this was so. The matter was referred to the Works Committee for consideration and report.

Fulham.—Premises are to be taken at 603, Fulham Road, for the purpose of establishing a central office and showroom for the electricity undertaking. The approximate cost of adapting the premises will be about £300.

Marylebone.—The Electric Supply Committee reports that inquiries are frequently being received for prices for current to be used for electrical vehicles. The Committee had provisionally arranged as follows:—A minimum consumption of 100,000 units per annum to be taken at Aybrook Street, Rathbone Place, or the generating station, the rate to be ½d. per unit between 11 p.m. and 6 a.m., this price also to hold good for Saturday afternoons, Sundays and holidays, but no supply to be taken during the evening lighting peak; on other days between 6 a.m. and 11 p.m., the price to be 1d. per unit, provided that no supply is taken during peak hours. For a less quantity than 100,000 units per annum or for the delivery of current in any other part of the borough than the stations named above, a higher price will be charged. After consultation with the Improvements and Housing Committee, the following rates have been arranged for the John Street dwellings:—7d. per week per lamp (sitting room), 5d. per week per lamp (bedroom with metallic-filament lamp), 3d. per week per lamp (bedroom with carbon lamp). This price is inclusive in each case of maintenance and installation cost, and in no case is there more than one lamp in the room. The report proceeds as follows:—"The situation has been a little complicated by the action of the Gas Light and Coke Co., in removing their meters and heating apparatus. In case this were done, we had already agreed a course of action with the Improvement and Housing Committee, which would immediately put the tenants in a position in no way inferior to that occupied in relation to the Gas Co. We give them the choice of retaining their gas cooking apparatus on the same terms, or of having an electric heating plate to answer the same purpose. The Gas Co. are, of course, bound to supply gas to the dwellings, and those tenants who do not prefer electricity for cooking purposes will be supplied with gas and apparatus on hire as before, only by the Council. This unlimited service system may be made applicable to other similar premises." In another portion of their report, the Committee say:—"The general manager reported to us that at a recent meeting of the Board of Guardians, an amendment was moved to a proposal that the General Electric Co. should supply Osram lamps to the workhouse at list price, less 20 per cent., the amendment being that the order should be given to our department, who could supply at the same price. Objection was taken to the amendment on the ground that it was wrong for the Council's undertaking to compete with contractors who had to pay rates, and the amend-

ment was lost. As the suggestion that the department compete, seems to have been widely spread, we wish to point out, firstly, that the General Electric Co. are not ratepayers of the borough; and, secondly, that there was no competition, as there is a uniform price at which these articles are sold, below which no one may offer them. It is true that the undertaking being in the trade and very large buyers, can obtain these lamps at a price which can show a profit on re-sale at list price, less 20 per cent., but the suggestion that there was competition is altogether out of place, inasmuch as the very lamps which we would have supplied, had we obtained the order, would have been sold to us by the General Electric Co. at our recognised price."

Islington.—The Lighting Committee reports having had before it a letter from the L.C.C. stating that it had under consideration the question of taking proceedings to enforce compliance with the notice served upon the B.C. in July, 1907, requiring the establishment of five electricity testing stations within the B.C.'s area of supply, and inquiring whether the B.C. disputed the reasonableness of the requirements or wished to raise any question which would require to be settled by arbitration. The Committee proposes to call a conference of other Metropolitan B.Cs. with a view, if possible, of uniform action being taken. The Council further reports that, pending the receipt of the sanction of the L.C.C. to the borrowing of £16,684 for increasing the capacity of the mains, a portion of material to the value of £1,000 is to be ordered at once on account of the urgency of the matter. Sixteen flame arc lamps are to be installed in Brewery Road, Cross Street, North Road and Market Road, at an estimated cost of £660. Forty gas lamps will be displaced which, at a cost of £3 0s. 11d. per lamp per annum, represented an annual expenditure of £122. The cost of the maintenance of the 16 arc lamps will be £60 per annum.

Bermondsey.—A special meeting of the B.C. was held on Tuesday evening for the purpose of considering an application to the B. of T. for an extension of the Council's area of supply, so as to include the whole of the Bermondsey area. At present the old parishes of St. Olave, St. Thomas and St. John, which include the Tooley Street district, are supplied by the County of London and London Electric Supply Companies. The proposal was strenuously opposed by several members on the ground that the Council's undertaking had not been a financial success, the case not only for the electric supply companies, but also for the gas interests, finding warm support. In support of the proposal, it was stated that the Council's average price was lower than that of either company in the Bermondsey area, while in the Tooley Street district the companies' average price for lighting was 5d. to 5½d., and for power 2d. per unit. Some 200 to 300 residents in the proposed extension area had petitioned in favour of the extension. By 28 votes to 23 the Council decided to apply for the proposed order, and to brief counsel to appear at the inquiries.

Lydney.—The U.D.C. has withdrawn its condition, imposed upon the Chepstow E.L. and Power Co., that the supply of current to Tutshill should be at the rate of 5d. per unit maximum, and terminable at six months' notice. In place, a resolution has been passed fixing the maximum price at 6d. per unit, and the period of notice at one year.

Newport (Fife).—The petition submitted by 150 electors and consumers of electricity requesting the Council to grant facilities for the extension of the system of overhead wires by the Tayside Electric Light Co., came before the T.C. at its last meeting, when it was resolved to take no action in the matter.

Norwich.—The T.C. has been recommended to adopt a scheme for converting the present gas lamps to electric lighting. The work is to be done in three portions, the first area to be taken over by the Electricity Committee on October 1st next, the second area in 1912, and the third area in 1913. The first area will displace 754 gas lamps.

Paisley.—Messrs. A. F. Craig & Co., Ltd., engineers, are contemplating the installation of electric plant in their works. They have decided to install a steam turbine for the production of electrical energy, independent of a supply from the Corporation.

Portsmouth.—Acting on the suggestion of the L.G.B. Inspector, the Electric Lighting Committee has withdrawn the application for £1,500 for meters in connection with the loan of £24,000.

St. Helens.—The T.C. has obtained from the L.G.B. sanction to loans of £566 for extension of buildings; £5,073 for switchgear and a turbo-alternator; and £4,567 for transformers, rotary convertors, boilers, mechanical stokers and water softening plant. The L.G.B. excluded a sum of £24 in respect of outstanding debts.

The T.C. has decided to give a supply of current to the Baxter Works of the United Alkali Co., Ltd., by means of the tramway feeders.

Salisbury.—At the meeting of the T.C., the Finance Committee recommend that no opposition should be made to the application of the Salisbury E.L. and Supply Co., Ltd., to the B. of T. for a provisional order to extend its area of supply to the limits of the present municipal boundary.

Shirebrook.—The Shirebrook Colliery Co. have arranged to light the model village with electricity at 35s. per lamp per annum.

Swinton and Pendlebury.—The U.D.C. has decided to give moral support to the Bill of the I.M.E.A. seeking powers for local authorities to undertake wiring work, and to supply lamps and fittings.

The Curragh (Co. Kildare).—The War Department has a scheme for the electric lighting of the Curragh Camp, the military camp of Ireland, and has placed an order for the supply of three Mirrlees-Diesel oil engines direct-coupled to 55-KW. generators, also an open-type cooling tower, with Messrs. Mirrlees, Bickerton and Day, Ltd., Stockport.

Teignmouth.—At a recent meeting of the Council it was reported that Mr. J. A. Purves attended before the Finance Committee and stated that the Electric Supply Corporation had offered terms for the supply of electricity in bulk to the Teignmouth area, but that before deciding on the matter he desired to know whether the Council would lay the mains and purchase the electricity in bulk and sell the same as part of its undertaking. Mr. Purves stated that it was of importance to have an early decision, as the B. of T. proposed to revoke the Teignmouth electric order.

Tonbridge.—Last week Mr. H. R. Hooper held an inquiry on behalf of the L.G.B. into an application of the Council to borrow £1,441 for electricity purposes. The application was partly for service charges in substituting electric for gas lamps for public lighting. As is usual in cases of this sort where it is desired to supersede street gas lighting by the more efficient and generally less costly metal-filament lighting, the proposal met with a hostile reception at the hands of Mr. Hooper.

Torquay.—The T.C. having obtained sanction to a loan of £4,500 for mains extensions, has decided to proceed with the extension to Chelston, where current will be available in about five weeks.

Watford.—The U.D.C. has decided to supply current for outside shop-lighting at 3½d. per unit.

TRAMWAY and RAILWAY NOTES.

Aberdare.—The U.D.C. has been recommended to promote a Bill seeking powers to construct tramways in the district. With a system of trackless cars for the outlying districts the estimated cost is £44,000.

Australia.—The question of electrifying the Melbourne suburban railways was revived in the Legislative Council recently, when Mr. Melville (Melbourne North) moved that a Select Committee be appointed to inquire into certain answers given by the Railway Commissioners to questions asked by him in the House respecting the Brunswick and Coburg Railway. The replies referred to showed that the traffic on that line was infinitesimal, though the tramways were greatly overcrowded. The Commissioner of Public Works, the Hon. W. L. Baillieu, asked the House not to pass the resolution, as the Government was appointing a Commission to inquire into the electrification of the whole of the suburban railways and their relation to the tramways. Several Members suggested that the Coburg Railway would be the most suitable for conversion in order to give the general scheme a trial.—*Australian Mining Standard.*

Belfast.—A special meeting of the Electrical and Tramways Committee was held on the 17th inst. regarding the proposed tramway line to M'Art's Fort, Cavehill. Two proposals were before the meeting—one the route *via* the Ligoniel way to the Horseshoe Curve, and thence by a new line up the back of the mountain. The second was *via* the Cavehill Road and the old line to the foot of the mountain. The former route was decided upon by 9 votes to 1. The question of the construction of a new line along the Dufferin Road to the yard of Messrs. Workman, Clark & Co., Ltd., was discussed and adjourned.

Bolton.—The B. of T. has sanctioned the doubling of the tramway line along Folds Road and Tonge Moor. It is also proposed to extend the double line in Bury Road.

Glasgow.—A deputation having been heard on the advisability of direct communication between the North Kelvinside district and the locality to the west of the Kelvin River, the manager has been instructed to report on the whole question of future extensions of tramway facilities.

Some time ago the residents in Kirkintilloch appointed a tramway extension Committee. Under the auspices of that body a public meeting has been held, at which a motion was passed in support of the movement for the extension of the Glasgow Corporation lines from Bishopbriggs to Kirkintilloch. The Tramways Committee of the Glasgow T.C. is to receive a deputation on the subject shortly.

The Corporation's Sub-committee on Tramway Finance has had before it the assessment notices for the municipal year 1910-11, from which it appeared that the department is being charged on the full annual value of the tramway lines, instead of on one-fourth of the value, in respect of assessments for police, sanitary, statute labour, sewage, roads and bridges, parks, registration of births, registration of voters, diseases of animals, and lunacy; and having heard the town clerk on the subject, it instructed him meantime to intimate an appeal against said assessments, and to obtain the opinion of counsel as to the legality of the assessments.

(*Continued on page* 669

NEW PLANT OF THE NORTHAMPTON POLYTECHNIC INSTITUTE (LONDON).

The Northampton Polytechnic Institute, which is situated in the industrial district of Clerkenwell, has just claims to be considered one of the most progressive and energetic teaching institutions of the metropolis, as may be inferred from the fact that it was the first, we believe, to provide an organised course of instruction in wireless telegraphy, and more recently it has led the way in connection with the rapidly developing subject of aviation. It also specialises in horology, an industry of which Clerkenwell is the headquarters. But notwithstanding the many other directions in which it is performing excellent service, the Institute has not failed to maintain its efficiency in teaching the subjects which it has in common with other such institutions. Under the wise guidance of the Principal, Dr. R. Mullineux Walmsley, aided by the enthusiastic energy of his late colleague, Dr. C. V. Drysdale, the Electrical Engineering Department has long possessed unique features of interest, and just lately it has had the good fortune to acquire an entirely new equipment of electrical generating plant, comprising high and low-pressure generators, switchgear, transformers, &c., exactly on the lines of standard practice, and embodying on a reduced scale all the essential features of a town supply system.

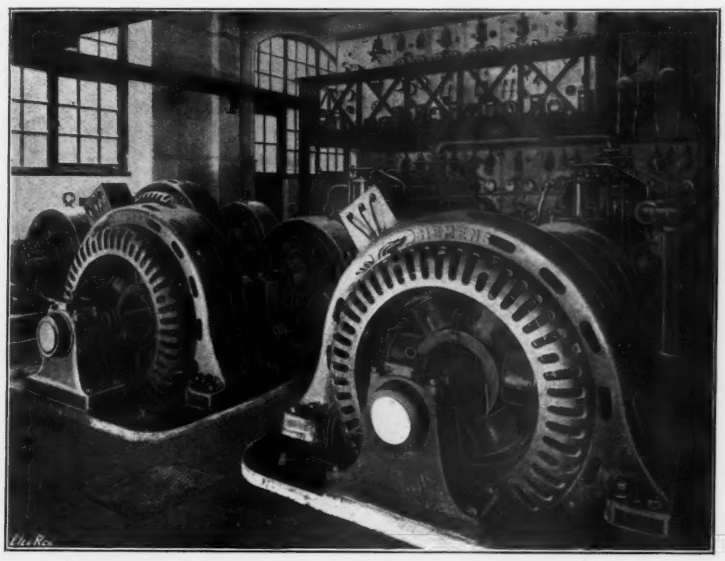


Fig. 1.—General View of Generating Station.

There are those who maintain that the principles of electrical engineering can be imparted to students just as effectively with machines of old patterns and obsolete characteristics as with the most modern and efficient apparatus, and we do not combat this view; indeed, in some respects the older types are more suitable for the purpose of teaching, for the very reason that their faults are more prominent, and that the difficulties which have been overcome in later designs are still conspicuous in the earlier ones. But we are bound to admit that the moral effect of first-class modern apparatus upon a student is a very important consideration. To him—especially to the beginner—the advantages of old material for teaching purposes are totally unknown and unvalued; he sees and appreciates only externals, and craves to handle "the real thing." We think it, therefore, most important that while a technical college shall possess a variety of apparatus suitable especially for teaching principles, it shall also be equipped with the very best modern plant obtainable; the latter commands the student's respect, while the former appeals to his intellectual side—to say nothing of his reverence for the antique.

There is another reason which may be alleged in favour of the use of modern plant—viz., that the student who handles it is thus enabled to qualify himself to earn his living when he leaves college. This is a dangerous line to follow. Up to a point it is justifiable; but its tendency is to provide merely manual training, for which a high-class technical college is not the proper place. It is here that the short-sighted utilitarian comes into conflict with the educationist, whose aim is to teach his students *to think*, not merely to pull switches and tap voltmeters. The former would train a student to be a workman or operator; the latter lays the foundation of an engineering career.

Turning from these abstract considerations to the immediate subject of this article, we have thought the new equipment of the Institute worthy of special illustration, as a remarkably complete example of an up-to-date installation for a technical college.

The generating plant comprises two tandem sets, each consisting of a 50-kw. Siemens compound-wound dynamo, working at 200-230 volts, and a 50-k.v.a. Siemens three-phase alternator, giving 2,200 volts at 25 cycles per second; each set is driven at 500 r.p.m. by a six-cylinder Gardner gas engine of 108 b.h.p., supplied by Messrs. Norris and Henty. Gas is supplied for the engines by a pair of suction-gas producers made by Messrs. Bennett & Tapley, which are

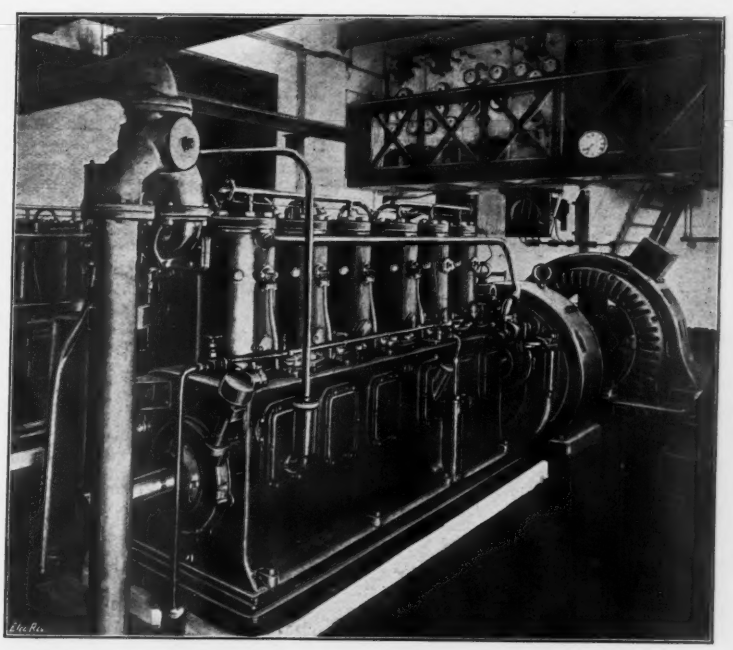


Fig. 2.—One of the Generating Sets.

situated out of doors. The Polytechnic swimming bath has been utilised as a cooling pond for the engines, to the benefit of both departments, as the waste heat of the engines is thus employed to warm the water when the bath is in use; two cooling tanks are also provided for use in case of need. The plant is guaranteed to consume not more than 0·9 lb. of anthracite coal per B.H.P.-hour on full load, and 1·25 lb. at half-load, and the water consumed is guaranteed not to exceed two gallons per B.H.P.-hour at full load. Either or both of the engines can be connected to either or both of the producers, and a mixing chamber is provided to ensure uniformity of quality of the gases from the producers.

The generators are of the best modern design, and are guaranteed not to heat up more than 70° F. after six hours' run at full load; they can withstand an overload of 25 per cent. for one hour, and 50 per cent. momentarily. The efficiency of the dynamos is 88 per cent. at full load, and

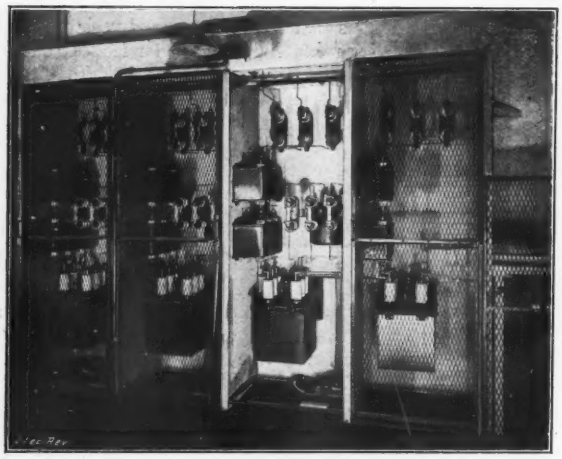


Fig. 3.—High-pressure A.C. Switchgear and Transformer Cells.

$85\frac{1}{2}$ per cent. at half load, and that of the alternators is $86\frac{1}{2}$ per cent. and $82\frac{1}{2}$ per cent. at these loads.

A Siemens motor-generator set is installed in the engine room, consisting of a synchronous three-phase motor of 45 B.H.P. at 2,200 volts, 500 R.P.M., coupled to two dynamos,

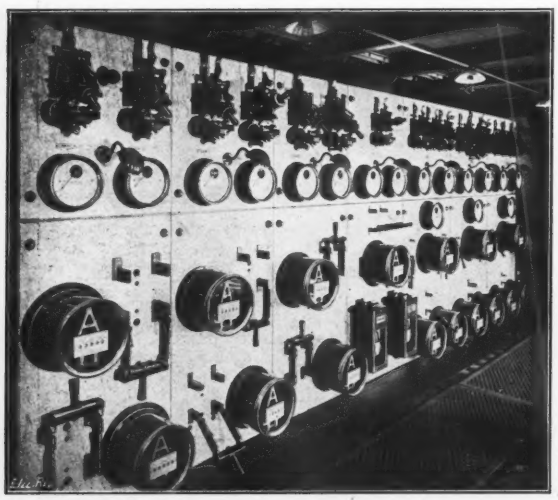


Fig. 5.—D.C. Feeder Board.

one of 25 KW. output at 200-220 volts, and the other of 27·5 KW. at 100-110 volts.

The switchgear closely follows standard central-station practice; it consists of four switchboards—one high-pressure A.C. "bench" board with two generator, one motor and one transformer panels; one low-pressure (350 volts) three-phase vertical switchboard, with one rotary converter, one transformer, and two feeder panels; and one D.C. main switchboard in two parts, with four generator, three booster-balancer, one rotary converter, and six feeder panels. The A.C. boards are mounted at one end of the engine room on a gallery, and the D.C. boards at the other end, one-half on a gallery and the other beneath it.

The high-pressure A.C. switchgear is of the remote-control

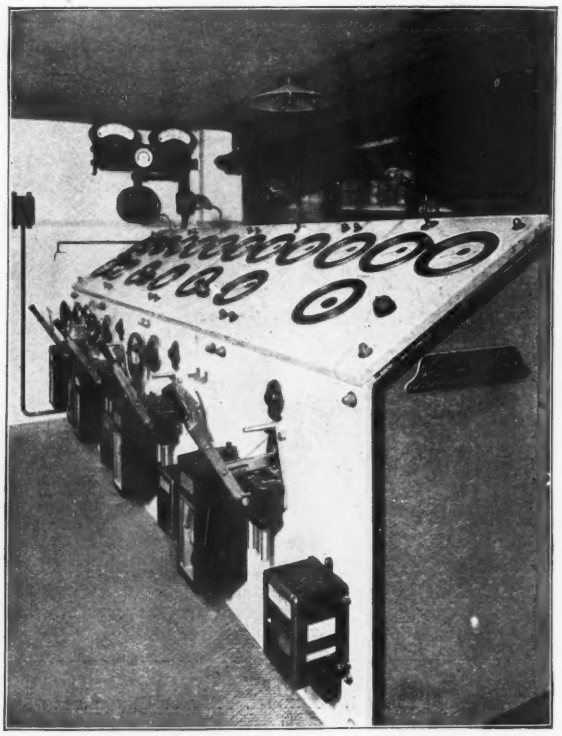


Fig. 4.—A.C. Bench Switchboard.

type, in four stone cells, which are placed in a separate room with the transformers, the latter being also in separate cells. In this room also a rotary converter of 30 KW. is installed.

The engine room is provided with a travelling 3-motor 2-ton crane by Messrs. Higginbottom & Mannock, and is artificially ventilated.

A storage battery made by the D.P. Battery Co., consisting of 106 cells of 600 A.H. capacity, has been installed, with an automatic reversible booster-balancer set.

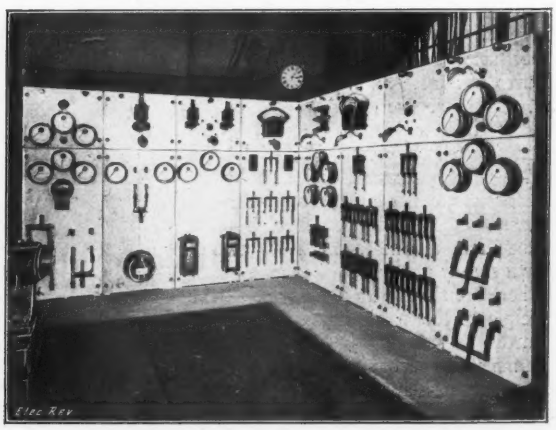
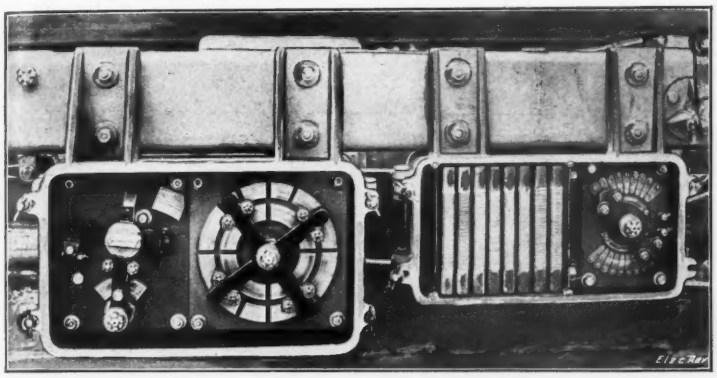


Fig. 6.—Sub-station Switchboard.

The four transformers are of 13·7 K.V.A. each, transforming from 2,200 to 330 volts, and three regulating transformers with a rotary regulating switch have been provided.

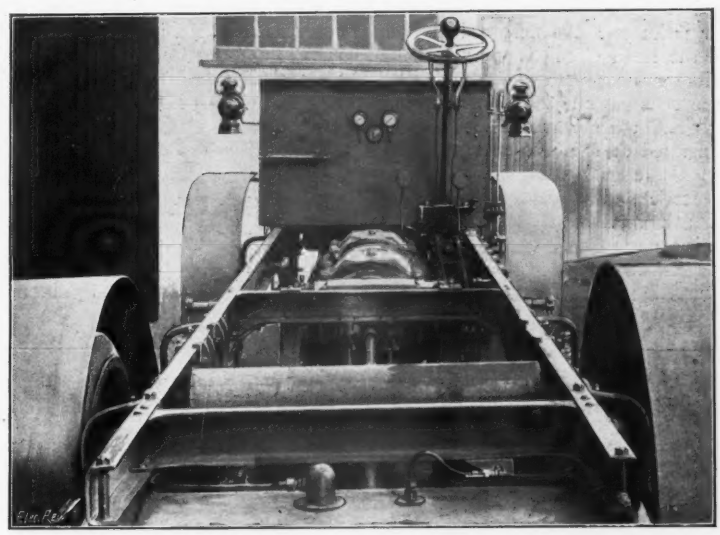
About 100 ft. away from the engine room is a sub-station switchboard, which is supplied from the generating station through recording instruments, and is used both for testing and for distributing power to the building. We may here mention that the whole installation will be run on a com-

mercial basis; coal, wages, &c., will be charged up against the generating station, and all energy supplied to the Polytechnic, for whatever purpose, will be duly metered and charged for. At the same time, the plant has been installed chiefly for instructional purposes, and will no doubt lend itself admirably to this purpose.



Main Controller and Field Regulator Boxes with Covers Removed, Stevens Chassis.

The installation was carried out entirely by Messrs. Siemens Bros. Dynamo Works, Ltd., of Caxton House, S.W., to the requirements of Dr. R. Mullineux Walmsley, and will be seen to be exceptionally complete and well-conceived. As we have pointed out, such plant is well calculated to interest the student and arouse his enthusiasm, and its management serves a most valuable purpose so long as it is regarded strictly as a means to a higher end, and not the end itself. In the hands of so experienced an educationist as Dr. Walmsley, who is a specialist in such questions, there can be no doubt that the installation will be utilised to the best advantage, and the Institute is to be congratulated on its good fortune in becoming the possessor of an equipment of such wide scope and flexibility.



View showing Electric Generator and Motor, Stevens Chassis.

"STEVENS" PETROL-ELECTRIC VEHICLES FOR INDIA.

It is some time since we described the Hallford-Stevens omnibus, in which the Stevens electrical system, in conjunction with the "S. B. & S." drive, was employed. This vehicle has now covered some 85,000 miles in London service, and is reported to be in excellent condition; moreover, similar vehicles have been supplied to H.M. War Department, the Brighton, Hove and Preston United Omnibus Co., and for the Loughborough omnibus service.

In the chassis illustrated below, however, only one continuous-current dynamo and one electric motor are used, lighter construction being obtained by this arrangement. The dynamo, coupled to a four-cylinder 100-mm. bore × 150-mm. stroke engine through a flexible coupling, is of the shunt-wound interpolar type, designed to run sparklessly at any load or speed, and supplies electrical energy to a series-wound electric motor coupled to the road wheels by means of a cardan shaft, differential and worm gear, on a "Dennis" 3-ton back axle. At full load the output of the dynamo is 22 kw.

The motor is of the four-pole enclosed type, closely resembling the ordinary tramway motor in its design. Control of the vehicle is effected partly electrically and partly by means of the engine throttle.

The principal items of the control equipment are the main controller, worked by a side lever, corresponding to the change-speed lever on a gear-driven vehicle, giving two forward speeds and one reverse; and the field-regulating rheostat of the generator, which is worked by a small lever moving over a quadrant on the steering column. The controller box also contains a main switch actuated by a foot

The Stevens Petrol-Electric Chassis, showing the Controller Boxes.

pedal. The engine control is effected by an accelerator pedal, by which the throttle can be opened by foot control, and which, on being released, throttles the engine down to such a speed that the dynamo does not generate, even with a full field.

The main controller gives two forward speeds and one reverse. No series resistances are used. Owing to the fine voltage control of the dynamo (through the field regulating switch), two speeds on the main controller are ample; in operation, the top-speed position is used for anything except steep hills. The main controller itself is contained in an aluminium case carried on the side frame together with the shunt resistance, and consists of an inner and an outer ring of metallic contacts on a slate base, arranged as shown in one of our views.

Over these contacts moves a four-arm switch; current is never broken by the controller itself, but on the pedal-operated main switch, which is provided with carbon contacts and a magnetic blow-out, and is interlocked with the controller lever, so that that lever can only be moved when the main circuit is broken.

The field regulating resistance for the generator is, with its switch, contained in a watertight case accessibly mounted on the side frame near the controller.

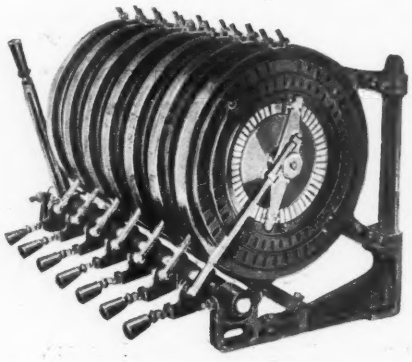
The control of the speed of the vehicle is effected almost entirely on the accelerator pedal and the field switch, and under ordinary conditions the main circuit is never broken, even when stopping. Before starting, unless the gradient is very steep, the controller lever is put into second speed with the engine running slowly and the generator field reduced, and as no current is generated at this engine speed, the vehicle remains stationary. In order to start, the brakes are released and the engine is accelerated by opening the throttle with the pedal, so that with the increased speed the dynamo excites. The field switch is then gradually operated to raise the voltage as the vehicle gains speed. The running speed is thus controlled by the throttle pedal. To stop the vehicle, the throttle pedal is released, and the brake applied, without, however, breaking the main circuit.

The vehicle which we illustrate is designed for public service in Central India, and with another of the same size, will carry a char-a-banc body to accommodate 40 persons. The weight of the chassis is 2 tons 17 cwt.

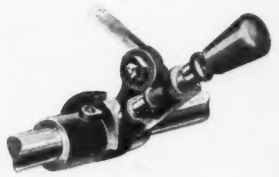
"Stevens" petrol-electric omnibuses of a rather smaller type than the above are now running in public service at the Hague.

The "Stevens" petrol-electric chassis are especially adapted for use as shooting brakes, light char-a-banc and private omnibuses, on account of their great flexibility and extreme silence. For military work, owing to their carrying a self-contained generating plant which will run the largest type of searchlight, they are already being found very useful.

Owing to the great increase of the business of Messrs. J. and E. Hall, Ltd., in the "Hallford" gear-driven chassis, it has been mutually arranged that the construction of the "Stevens" petrol-electric chassis shall be carried out by Messrs. Stevens, Ltd., at their Maidstone works.



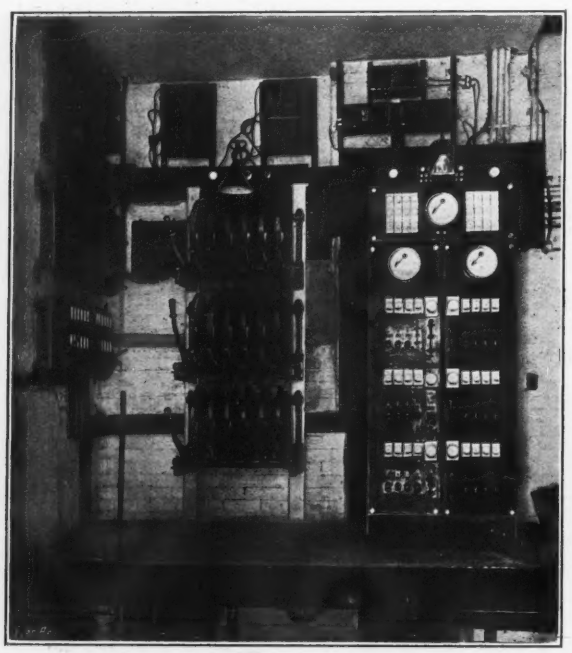
Seven-plate Igranic Dimmer showing Operating Levers.



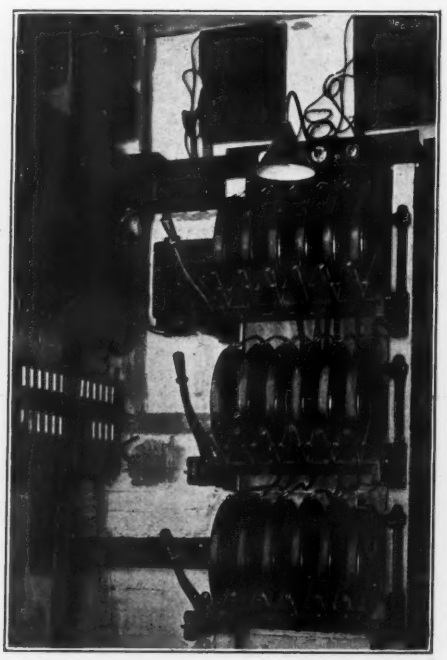
Operating Lever with Interlocking Bolt and Cam.

THE IGRANIC THEATRE DIMMER.

The Little Theatre—the dear little theatre, we had almost written—which has recently been opened in John Street, Adelphi, and which, with its cosy little interior and realistic stage lighting drew such favourable comment in the daily Press, owes some portion of this notice, at least, to the improved electrical arrangements adopted for illuminating the stage.



Stage Switchboard at the Little Theatre



Igranic Dimmer at the Little Theatre.

Contrary to the usual arrangement, at the rear of the stage of the Little Theatre an artificial horizon has been constructed in reinforced plaster, and a colour illumination scheme has been provided which faithfully reproduces the effects of dawn, sunrise, sunset, dusk or night, the latter being rendered more realistic by the appearance of a moon and stars on the artificial horizon.

For the control of the colour effect an Igranic dimmer has been used—for the first time in this country, we understand—replacing the usual liquid resistance dimmer.

Our illustrations show the stage switchboard at the Little Theatre, which we may add is in clear view of the stage, and the Igranic dimmer as installed by the Adams Manufacturing Co.

This dimmer consists of 18 plates assembled in three rows controlling respectively the white, red and blue lamps.

Each plate controls a batten, float or length, and consists of a circular soapstone base, on which are mounted some 50 copper contact segments and terminals, and the successive steps of resistance.

The resistance material is completely covered by a moisture and fireproof cement, and each plate is provided with an iron shield.

Regulation on each plate is effected by an operating lever, which is rigidly coupled to a double-ended contact arm ; but while each plate is controlled by its own lever, a master lever is provided in addition to each row of plates, by means of which they can be operated in unison, so that any series of lights desired can be dimmed or brightened at the same moment, and flashing effects are easily obtained.

A simple interlocking arrangement is provided, which can be seen in our views ; briefly, the master lever rotates the shaft running along the front of each row of dimmer plates, and with it a slotted cam adjacent to each operating lever. The operating levers are loose on the shaft, but a twist of the handle allows a bolt to fall on to the cam and into the slot when it arrives or is placed in the correct position.

It is thus possible to operate individual plates in advance, and subsequently, by means of the master lever to pick up the several plates, one by one, until the whole series are in use, enabling the illumination to be built up or reduced as desired. Although the equipment at the Little Theatre does not provide for it, a further refinement in control can be added by means of which it is possible to dim some lamps and brighten others at the same time.

A dimmer plate is attached by only three screws, and may be removed for inspection and repair in a few minutes without disturbing the remaining plates.

Although, as we have said, this is the first dimmer installation of its kind in this country—its introduction being due to Mr. W. E. Siday, the electrician to the Little Theatre—this type of apparatus is very popular in the States, New York and Chicago alone having equipments of this kind at more than 80 per cent. of the theatres.

We are not quite sure whether choice or fashion has led to the almost general use of the liquid type of dimmer in this country so far, but from an engineering standpoint the compact mechanical form of apparatus with rigid drive has many obvious advantages.

There are no wires to stretch, break, come off pulleys, &c., at awkward moments ; no liquid to boil with prolonged use and disturb regulation, or to splash over and cause earthing ; the regulations which necessitate the placing of the liquid pots in a separate chamber, and therefore out of sight of the man who is depending on their behaviour, do not apply to the self-contained apparatus used at the Little Theatre.

We do not, of course, suggest that all liquid dimmers are subject to the list of ills mentioned above, but certainly many are, and in any case the alternative is worth consideration.

In addition to the dimmer control of the colour effect, the mercury vapour lamp has been pressed into service at the Little Theatre, with a view to more accurately similating moonlight effects ; "moon and star" lamps behind the plaster horizon can be switched on as desired, and a twinkling effect obtained with the latter.

The usual footlights are supplemented by an additional auditorium batten, in the roof of the auditorium, but shielded from the audience, which provides additional downward illumination on the stage from the front.

The whole of the lighting in the theatre has been carried out in excellent taste, and is, of course, supplied from two independent mains, one being the theatre main of the Charing Cross Co. We are indebted to Mr. W. E. Siday who arranged the colour scheme and supervised the electrical installation work, and to the Adams Manufacturing Co. for assistance in preparing this article.

TRAMWAY and RAILWAY NOTES.

(Continued from page 664.)

Bexhill.—Complaints have been made to the Council as to the noise caused by the cars in rounding curves. The company was written to on the matter, but the Council considering the answer unsatisfactory, has instructed the town clerk to communicate with the B. of T.

Birkenhead.—A petition from the residents of Bromborough and Bromborough Pool, Cheshire, asking the Bromborough U.D.C. to negotiate for an extension of the Birkenhead tramway system on the Port estate, has been considered by the General Purposes Committee, who have referred the matter back in order that information might be obtained as to what action the Lower Bebington Council proposed to take.

Blackpool.—The Tramways Committee of the Corporation recommends that six cars of a new type be purchased from the United Electric Car Co., Preston, for use on the Promenade and Lytham Road route.

It was stated on October 13th that by the end of the month the returns on the tramways will show a surplus of £5,000 in the summer-season takings, as compared with the amount for the corresponding period of last year. There was a deficit of about £2,100 in June, but not only has that been wiped out, but up-to-date the receipts are £2,708 to the good.

Continental Notes.—GERMANY.—A fresh offer for the the construction of a suspended electric railway in Berlin has just been made by the Continental Co. for Electrical Enterprises, which has been advocating the scheme for nearly 12 years, and which built a trial section in a part of the Brunnen Strasse a few years ago. The new proposal, which has been placed before the supervising authorities for approval, seeks to overcome certain difficulties due to the narrowness of streets by making two cuts through the existing buildings. Apart from this circumstance the company states that the carrying out of the scheme would not be accompanied by any demands upon the city for contributions, provided that permission is given to the company to utilise the narrow portion of the Brunnen Strasse. In the event of securing consent under the secondary railway law, the company would be prepared to cede to the city a suitable share in the net profits earned by the railway, but the company declines to pay a fixed charge for the grant of consent, as such an impost could only reasonably be paid out of the surplus on working. It would be equivalent to an unproductive increase of the invested capital, and would render difficult the introduction of low fares in the early years when the necessary traffic was undeveloped. But in case the authorities sanction the scheme under the conditions set forth by the company, the latter is prepared to introduce a uniform fare of 10 pfennigs (1½d.). It is added that no other system of high-speed railways which is dependent upon providing interest on the share capital can offer a fare capable of meeting the competition of the fares charged by the tramways and omnibuses.

Plans are being prepared in respect of a projected electric tramway between Buer and Gladbeck, Westphalia.

RUSSIA.—A grant has been secured by a company for the right to build an electric railway between St. Petersburg and Ymatra. The power will be obtained from falls in the Ymatra River, which can furnish, in addition, power sufficient to meet the requirements of various industrial establishments in and around St. Petersburg, the terms of the concession also embracing such prospective developments.

ITALY.—The Leghorn Tramways Co. and the Leghorn Electric Lighting Co. have jointly acquired the steam tramway undertaking which runs between Pisa and Marina, with a view to its conversion to electric traction and extension to Leghorn.

Croydon.—A length of double tramway line is to be put in near East Croydon station at an estimated cost of £350.

Heywood.—The T.C. on Thursday, October 13th, had an application made to it for extending the electric tram service over the new road to Middleton, in order to link up the two towns, and give a through car service to Manchester. For many years there has been an agitation for better road accommodation between Heywood and Middleton, and as a result of agreements on the part of the two Corporations, a wide and well-laid road had been constructed, costing £18,140. Statistics as to pedestrian and vehicular traffic were presented in support of the contention that trams would be a great convenience, the train connection not being all that was desired. The Chairman of the Tramways Committee said the Committee had had all the points under consideration, and it was anxious to have the trams. Alderman Marlor assured the Council that it had friends in Middleton who would assist it in making an effort to get the connection by the electric tramway system.

Hove.—Replying to a question at the meeting of the T.C. on October 13th, Councillor Jago stated that no official communication had been received as to the intention of the B.E.T. Co. to present a Bill for the purpose of constructing tramways in the borough.

London.—L.C.C.—The Highways Committee proposes to obtain Parliamentary sanction for the construction of five new tramways in the N.E. and S.E. of London, and the reconstruction of an existing line. This represents 7 miles of single track, and the estimated cost, inclusive of cars, sub-stations, &c., is £185,940, and £108,350 for street improvements. These additional schemes increase the total estimate for tramway proposals for the 1911 session to £829,040 for construction and equipment, and £354,350 for improvements.

The Council has agreed to supply about 67 ft. of conduit track to the Imperial College of Science and Technology, at cost price.

In connection with the proposed new City bridge, the L.C.C. has offered, on certain conditions (connected with the suggested tramway across the bridge, which would provide an additional link between the North and South), to contribute £300,000 towards the cost. This the Bridge House Estate Committee cannot agree with, mainly, it is suggested, because the L.C.C. proposes to charge the cost to rate account instead of tramway account. By charging the cost to rate account the City would have to bear its share of the cost.

Milnrow.—The town clerk of Rochdale has written the U.D.C., stating that as the construction of the Whitworth Tramways No. 2 and Bacup Light Railway is now being proceeded with, the Rochdale Tramways Committee cannot commence work on the Milnrow tramways at present, but arrangements will be made for proceeding with the work early next year.

Newcastle-on-Tyne.—At a meeting of the Corporation Tramways Committee, on the 13th inst., consideration was given to the tramway items in the new Parliamentary Bill which the Corporation is about to promote. As a result of the deliberations it was decided to include the following items:—To lay tramway lines from New Bridge Street, through Clarence Street, to Jesmond Road end; to extend Jesmond tram-lines to Heaton and to the city boundary on Benton Road; to extend the lines on Scotswood Road, through the urban district of Newburn to Throckley; to run railless trolley cars from Scotswood Bridge end to Blaydon, the weight of loaded cars not to exceed five tons. Further, to enable the Corporation to supply electrical energy in Newburn and Castle Ward Union, and in any other district through which it now runs, or seeks powers to run, electrical cars or other electrical vehicles; to run motor-omnibuses, and to run trailer cars in the city. A deputation of the Tramways Committee waited upon the Castle Ward Rural Council to ask the consent of the Council to run railless trolley cars to Westerhope and Whorlton Church. By 17 votes to 10 the meeting decided against consent being given.

Plymouth.—At a meeting on Monday of the Works Committee it was reported that the Tramways Committee had received a letter from the secretary of the Devonport and District Tramway Co., asking the Council to appoint a small committee to meet the directors and discuss the question of through running arrangements between the two tramway systems. Consideration of the matter was adjourned until the next meeting.

Preston.—The annual report, issued on the 14th inst., of the Preston Tramways showed that during 1909-10 there had been 8,484,589 passengers carried, against 8,529,951 in the previous year. The revenue per car-mile worked out at 10·01d., and the working expenses at 6·16d. The total income for the 12 months was £38,417, as compared with £23,495 in the previous year, the gross profit being £15,284 against £15,368. The available balance in the reserve fund now amounts to £20,856.

Southport.—At the T.C., on the 11th inst., a long discussion took place on the question of Sunday running of the tramways. Councillor Snow pointed out that 2,000 persons had signed the petition for a plebiscite at the earliest possible date, and he moved that a plebiscite be taken. Councillor Shuttleworth seconded, and said the matter had been shelved for 22 weeks. Councillor Winterbottom said a petition so largely signed ought to be respected. Sunday cars were already largely used in Birkdale. In the end it was decided that the question of the running of Sunday cars be referred to the first meeting of the Town Council after the proposed extension of the borough.

Swansea.—A Sub-committee of the Corporation is to confer with the directors of the Swansea Improvements and Tramways Co. with a view to ascertaining if terms can be arranged by which the company's system shall pass into the hands of the municipal authority. The proposal has arisen from the fact that notice has been given, according to Swansea's powers, to acquire the High Street-Mount Street section, but under its powers the Corporation on the acquisition of any particular section has to give the company a lease of such section for 21 years, during which period no other section can be acquired. It is computed that this means that the whole of the company's electric tramway system cannot come into the possession of the Corporation till about the beginning of the next century. The Sub-committee that has been appointed is, therefore, to ascertain if the company are agreeable to arranging terms by which the town can acquire practically at once. It is understood that the chairman of the company (Mr Tegetmeier) has expressed his willingness to meet the Corporation in the matter. The High Street-Mount Street line forms an important link in the tramways of the town, and it may be added that the terms of purchase as laid down by Act of Parliament are constructive value less depreciation.

Truro.—At a meeting of the T.C. on Tuesday, the Public Works and General Purposes Committee reported that it had had an interview with Mr. Steele, a representative of Messrs. J. and W. Purves, regarding the obtaining of a provisional order for the supply of electricity to the city. On behalf of his principals, Mr. Steele agreed that Parliamentary agents might be employed by the Council at the cost of the promoters, to watch its interests during the progress of the provisional order through Parliament; and in the purchase clause, that six months instead of 12 months should be the period of notice, and that 14, 21, 28, or 35 years from the commencement of the order should be substituted, instead of 15, 22, 29, or 36 years, as the periods when the option of purchase might be exercised; that streets and parts of streets throughout which the undertakers were to lay suitable and sufficient distributing mains for the purposes of general supply within a period of two years after the commencement of this order be inserted in the third schedule to the provisional order. The Committee recommended that the terms be accepted by the Council, that the town clerk be empowered to employ Parliamentary agents, and prepare the necessary agreement for carrying into effect the conditions. The report was adopted.

TELEGRAPH and TELEPHONE NOTES.

Ceylon.—It is stated in the Colonial report on Ceylon just issued that there are now 939 telephones in use, and the average daily calls at the Colombo Telephone Exchange number 4,432. On the advice of Mr. J. Newlands, deputy controller of Post Office Telegraphs in London, the whole telegraph service of the island has been simplified and the service accelerated.

Colombia.—According to an American Consular report, the telephone service of Colombia is almost non-existent, although the Republic has an area of 486,000 sq. miles and a population of four millions; the telegraph system, however, is well developed, and the service is cheap.

Federated Malay States.—The Acting Resident-General of the Federated Malay States, in his report, states that at the close of the year there were 1,437 miles of telegraph and telephone line, with 4,311 miles of wire. Of this, 2,380 miles were telephone wires. The cost of maintenance was $64,953, and $45,879 was spent on construction, including $922 on police wires. The total expenditure on telephone construction was $35,147. During the year 263,435 telegrams were dispatched, and 267,144 were received for delivery. The revenue derived from this source was $66,443, an increase of $10,848 over the corresponding figure for 1908. The value of telegrams sent free for Government departments was $46,100. The revenue from telephones was $45,596, or $11,387 more than the receipts in 1908.

Municipal Telephones.—The Executive Council of the National Chamber of Trade last week passed a resolution urging the Government to give facilities to municipalities desirous of conducting the telephone service in their areas, or alternatively to appoint a Select Committee to inquire into the future administration of the telephone service.

Wireless Telegraphy.—According to *Lloyd's Register of British and Foreign Shipping*, there are now 702 vessels fitted with wireless telegraph installations and 459 with submarine signalling apparatus—a very excellent showing.

Owing to the difficulty in maintaining the submarine cables connecting the Orkney Islands, wireless telegraph stations have been erected on the islands of Sanday and North Ronaldshay, and will shortly be put in operation.

An American Consul reports that the Brazilian Government has erected a wireless telegraph station close to Rio Vermelho; the station is equipped with the Telefunken system, and has a guaranteed range of 400 miles, although its actual working range is far greater, as during trials recently conducted communication was readily established with the wireless station near Rio de Janeiro (about 730 miles) and with a vessel more than 1,000 miles distant.

The Italian Government has just placed on the Marine Budget a sum of 433,000 lire for the erection of six new radio-telegraphic stations in Italy's African Colony of Benadir.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—November 19th and 22nd. Telephone cable and testing instruments, for the P.M.G.'s Department. See "Official Notices" October 7th.

Melbourne.—October 25th. Deputy Postmaster-General. Electric lighting material (Schedule No. 311). See this column in our issue of September 30th.

November 4th.—6,000 metal-filament lamps, for the Melbourne City Council. See "Official Notices" October 14th.

November 4th.—80 A.C. and 640 D.C. electricity meters, for the Melbourne City Council. See "Official Notices" to-day.

N.S.W.—November 16th. Telephone, telegraph, and electric light material, for the P.M.G.'s Department in New South Wales. See "Official Notices" to-day.

November 2nd.—1,000 25-C.P. metallic-filament lamps for 110 volts, D.C., for the P.M.G.'s Department in New South Wales. See "Official Notices" September 30th.

November 2nd.—Insulators, covered wire, phosphor-bronze wire, and galvanised-iron stranded wire, for the P.M.G.'s Department in Queensland. See "Official Notices" September 30th.

November 23rd.—Cable, ironwork, pipes, conduits, switchboards, telegraph and telephone instruments, &c., for the P.M.G.'s Department in Queensland. See "Official Notices" September 30th.

Inverell (N.S.W.).—November 14th. Complete electrical plant for the municipality (J. E. Donoghue, engineer, Margaret Street, Balmain).—*Australian Mining Standard.*

Western Australia.—November 1st. Instruments, ironwork, cables, &c., for the P.M.G.'s Department. See "Official Notices" October 7th.

Birkenhead.—October 24th. Tenders are invited for complete installation of electric light and plant at the Hospital for Consumption, Heswall, near Birkenhead. (H. P. Cleaver, Union Offices, Brougham Terrace, Liverpool.)

Cardiff.—October 27th. Twelve months' supply of coal (washed peas and washed nuts), for the Corporation power stations. Mr. Arthur Ellis, engineer and manager.

Dublin.—November 7th. General stores for the Dublin United Tramways Co., Ltd. See "Official Notices" October 14th.

France.—October 31st. M. Voisin, Ingenieur-en-Chef des Ponts et Chaussées, 3, Boulevard de Chatillon, Boulogne-sur-mer, is inviting tenders for the supply and erection at the Loubet dock of 20 electric travelling cranes, and for the laying of the necessary electric mains to feed the same.

India.—October 26th. Two 100-KW. generators, &c., for the East Indian Railway Co., Nicholas Lane, London, E.C. Specification, one guinea, not returnable. See "Official Notices" October 14th.

Invercargill (New Zealand).—January 9th, 1911. Power-house plant, cars, rails, overhead material, wires and cables, poles, &c., for an electric trolley system, also street-lighting plant, for the Corporation. See "Official Notices" October 14th.

Johannesburg.—November 4th. Five electric tramcars for the Municipality. Tenders to Town Clerk. Specification, &c., to be seen at Commercial Intelligence Department of the Board of Trade, London.

London.—L.C.C.—October 31st. Stores. See "Official Notices" October 14th.

Peterborough.—November 3rd. About 4,716 yards of distributor cables, for the Corporation. See "Official Notices" to-day.

Spain.—The municipal authorities of Consuegra (province of Toledo) have just invited tenders for the concession for the electric lighting of the town during a period of 15 years.

October 31st.—The Spanish Post and Telegraph authorities in Madrid are inviting tenders for the concession for the establishment and working during a period of 15 years of a telephone exchange in the town of Badajoz.

Warrington.—November 15th. Motors and transformers for a year, for the Corporation Electricity Department. See "Official Notices" to-day.

West Ham.—The Education Committee has directed the architect to obtain alternative tenders for wiring Salway Place School by the Stannos and Simplex systems.

CLOSED.

Barnsley.—The T.C. has accepted the tender of Messrs. Heenan & Froude for a refuse destructor, £4,352.

Bothwell Colliery.—Messrs. Stevenson & McGuffie, consulting engineers, of Glasgow, have accepted the British Westinghouse Co.'s tender for the supply of the necessary motors required at the above colliery; the value of the first instalment is £1,012.

Canada.—Toronto, Ont.—According to the current issue of the *Canadian Engineer* the following contracts have been awarded here:—Transformers, Canadian General Electric Co., $15,800. Motor-generator sets, Lancashire Dynamo & Motor Co., $2,262 Storage batteries, Chapman & Walker Co., Ltd., $2,870.

Dartford.—The U.D.C. has accepted the tender of the Universal Manufacturing Co. for a feeder pillar, at £26 10s.

Glasgow.—The T.C.'s Tramway Committee on Works and Stores has recommended the acceptance of the following:—

Cable heads for power cables.—British Insulated and Helsby Cables, Ltd.
D.C.C. wire.—London Electric Wire Co.
V.I.R. cable.—W. T. Henley's Telegraph Co.
Clevis balls.—British Insulated and Helsby Cables, Ltd.
Globe insulators.—W. C. Yuille & Co.
Rail bonds.—Lahmeyer Electrical Co.

Messrs. Primrose & Primrose, electrical engineers, Bath Street, Glasgow, have secured the contract for the lighting of the Industrial Hall, the Kelvin Hall, the Arts Hall, the grounds proper, the "dip-the-dips," and the native village, at the forthcoming Scottish National Exhibition in Glasgow. The firm have also secured the fitting up of installations on three large ships being built on the Clyde, and the installation in the *News* office building in course of construction.

Government Contracts.—The following tenders have been accepted during the past month by the Government Departments named:—

Admiralty, Contract and Purchase Department.
Electric lamps.—General Electric Co., Ltd.; Edison & Swan Co., Ltd.; Rugby Lamp Co., Ltd.

Admiralty, Works Department.
Goliath electric crane for Admiralty Harbour, Dover.—Ransomes and Rapier, Ltd.

War Office.
Lamps.—Siemens Bros. & Co., Ltd.
Motors, &c.—Electric Construction Co., Ltd.
Re-winding motors.—J. P. Hall & Co., Ltd.; Lancashire Dynamo and Motor Co.; L. Scott & Co., Ltd.
Installation of electric light, Victoria Barracks, Windsor.—V. G. Middleton.

India Office, Store Department.
Crossings.—Edgar Allen & Co.
Crossings and switches.—T. Summerson & Sons.
Switchboards, &c.—Peel-Conner Telephone Works.

General Post Office.
Paper-core cable.—British Insulated and Helsby Cables, Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Siemens Bros. & Co., Ltd.; Western Electric Co., Ltd.
Switchboards.—Western Electric Co., Ltd.
Telephones.—British L. M. Ericsson Manufacturing Co., Ltd.; British Insulated and Helsby Cables, Ltd.; International Electric Co.; Western Electric Co., Ltd.
Telephone transmitters.—Peel-Conner Telephone Works, Ltd.
Local telephone exchange equipment at Creechurch Lane, E.C.—Peel-Conner Telephone Works, Ltd.
Two electric lifts at Returned Letter Office, Mount Pleasant, E.C.—A. & P. Steven.

Office of Works.
Electric lighting at Edinburgh General Register House.—W. Finlay & Co.
Fittings at G.P.O., King Edward Building (Contract No. 16).—Siemens Bros. & Co., Ltd.

Grimsby.—The T.C. has accepted the tender of Messrs. W. Browne & Co., Ltd., for 10,333 tons of Shirebrook coal for the electricity works, at 6s. 2d. per ton.

Kirkcaldy.—The rails for the extension of the Corporation tramways to Dysart are to be manufactured in Belgium. The condition of delivery is that inspection and final acceptance must take place at the makers' works before forwarding, and Mr. O. F. Francis, the electrical engineer, is to visit Belgium for that purpose. At a Town Council meeting the Convener of the Tramways Committee stated that no guarantee was given by British makers, and he regretted exceedingly that they had been compelled to go out of this country to buy the rails. The cost of the rails alone would be about £1,200, and the saving effected by taking the foreign rails would be about £140. He took it that the expense of examining the rails, passing them and having them tested, would be somewhere about £20. The Committee thought they were doing well in accepting the tender, and they would save the town considerably over £100 after paying all Mr. Francis's expenses.

Leatherhead.—Messrs. Siemens Bros. Dynamo Works, Ltd., have obtained the contract for maintenance of "Onewatt" lamps for street-lighting in Leatherhead and district.

London.—Messrs. Siemens Bros. Dynamo Works, Ltd., have obtained the contract for the General Post Office for tantalum and "Onewatt" lamps.

Bermondsey.—The B.C. has accepted the tender of the General Electric Co., Ltd., for 14 wrought-iron electroliers, at £6 10s. each, for the Town Hall; also the tender of the British Insulated and Helsby Cables, Ltd., for one special low-tension straight-through pillar for 5 cables, at £55 18s. 6d., and one L.T. 8-way Prescot distribution pillar, at £40.

L.C.C.—The Highways Committee received the following tenders for tramway and paving works, &c., connected with the reconstruction on the conduit system of tramways in Kentish Town Road *via* Highgate Road to Swain's Lane:—

Kirk & Randall (accepted)	**£22,486**
John Mowlem & Co., Ltd.	22,503
Dick, Kerr & Co., Ltd.	22,738
A. N. Coles	23,231
Alex. Stark & Sons	24,278

For the provision of an electric lift at 23, Belvedere Road, the tenders were:—

	Gear in basement, drum drive. Two openings to lift at ground floor.	Gear at top of well, drum drive. Three openings to lift at ground floor.
Medway's Safety Lift Co.	**£257**	**£282 (accepted)**
Smith, Major & Stevens	350	—
R. Waygood & Co.	352	350

Messrs. J. & C. Bowyer, Ltd., will supply the strong room and structural work for the lift at £645.

It has been arranged that duct-laying, cables and switch-panels, costing £2,140, £7,045 and £200 respectively, required in connection with the electrification of the Battersea Park Road to King's Road, Chelsea, and the Putney Bridge to High Street, Wandsworth, tramways, be carried out under existing contracts by Messrs. Reid Bros., W. T. Henley's Telegraph Works Co., and Johnson and Phillips, Ltd.

For the third portion of the Hammersmith car-shed, to provide accommodation for an additional 16 cars, the tender of Messrs. C. Wall, Ltd., at £2,280, is recommended.

LEWISHAM.—The contract for the complete electrical equipment of the Lewisham Hippodrome has been placed with Messrs. Siemens Bros. Dynamo Works, Ltd., who have sub-let the wiring work to Messrs. G. E. Taylor & Co. The Hippodrome will be lighted throughout by Siemens fittings and tantalum lamps, and the circuits protected by their "Zed" fuses. "Stannos" wires have been specified for the wiring.

Newport (Mon.).—The Corporation has recently accepted tenders for the following apparatus :—

Carbon lamps.—Edison & Swan and the General Electric Co., Ltd.
Radiator lamps.—Edison & Swan.
Various electrical meters.—Electrical Co., Ltd., Bat Meter Co., British Westinghouse Co., Ltd., Electrical Apparatus Co., Ltd.
Rubber cables. General Electric Co., Ltd.
Single paper cables.—Callender's Cable & Construction Co., Ltd.
Sale of superseded plant.—C. D. Phillips.
Steel girder work —T. H. Howell, Ltd.
Cast-iron pipes.—Jordans, Ltd., and Thos. Spittle, Ltd.
Cast-iron stanchions.—W. A. Baker & Co., Ltd.

Portsmouth.—The T.C. has accepted the tender of the British Insulated and Helsby Cables, Ltd., for rubber cables for the Lighting Committee.

Rotherham.—The T.C. has accepted the following tenders for coal for the electricity works :—

Sheepbridge Coal and Iron Co., Ltd.—Smudge, 5s. 4½d. per ton (80 per cent of total quantity required).
Messrs. Fitzwilliam, Low Stubbin Colliery.—Best Barnsley pit slack, 6s. 8d. per ton (20 per cent. of total quantity required).

Sheffield.—The T.C. has accepted the tender of the Electric Supply Department for installing the electric light and an electric lift at Worthing Road, at £66. The lowest tender (£63 10s.) was sent in by a private firm, Messrs. T. A. Ashton, Ltd. The tender of the electric light department has also been accepted for the electric light installation at the Park Baths, the combined tenders being £115 17s. 6d. against £116 12s. 6d. quoted by Messrs. T. A. Ashton, Ltd. The acceptance of the Department's own tender gave rise to some discussion, and an amendment adverse to the recommendation was only defeated by 30 votes to 21. The mover of the amendment wanted that part of the work for which Messrs. Ashton's price was lowest to go to that firm, but somebody else argued that the two jobs should not be separated. One Councillor said that the Coporation had no right to trouble firms to submit tenders unless it was prepared to respect those tenders. The Corporation Department having capital at its command at a price at which no private individual could obtain it, ought to be able to send in very much lower tenders; and if it did not do so there was something wrong that ought to be examined into. An Alderman, however, combated this view, and said that if there was a business in Sheffield that was over-capitalised it was that of the E.L. Department. They had no advantages against outside manufacturers as regarded labour—they paid quite as much, if not more, for it—or the purchase of materials.

Sunderland.—The T.C. has adopted the recommendation of the Electricity and Lighting Committee that the following tenders be accepted :—

Messrs. Rickards, Ltd.—220 yards of 19/16 and 220 yards of 19/18 cable.
Messrs. Ledwards & Beckett, Ltd.—Supplementary condenser, complete with electrically driven pumps and piping.
Messrs. Bennis, Ltd.—Mechanical stoker.
Messrs. Babcock & Wilcox, Ltd.—Swivel damper, frame and spindle.

Whitehaven.—The T.C. has accepted the tender of Messrs. Keith, Blackman & Co., for an electric fan for the ventilation of the wash-houses.

Wolverhampton.—The Corporation has placed a contract for electricity meters with the Electrical Apparatus Co., Ltd.

Worcester.—The following tenders for coal for the electricity works have been accepted by the T.C. :—

Underwood & Co., Ltd.—2,000 tons best Arley D.S. nuts, Tamworth, 10s. 6d. per ton.
South Wales and Cannock Chase Co.—Best screened nuts (Haunchwood Colliery), 11s. 3d. and 10s. 3d. per ton; ditto, beaus or D.S. nuts (Kingsbury Colliery), 9s. 7d; ditto, peas (Brownhills Co liery), 9s. 3d.; ditto, bright slack (Higuley Colliery), 7s. 8d.; ditto, smudge (Ansley Hall Colliery), 5s. 9d.; ditto, ditto (Highley Colliery), 4s. 9d.; Cannock Chase screened slack, over ⅜ in., and through 1¼-in. mesh, 9s. 5d.; best screened nuts (Kingsbury Colliery), 10s. 6d.

Yorkshire.—Mr. H. Moss has received the contract for lighting the new spinning shed at Clayton West, also for the supply and laying of paper-insulated lead-covered and armoured cables for the Grassington Electric Supply Co., Ltd.

FORTHCOMING EVENTS.

Institution of Electrical Engineers (Glasgow Local Section).—Friday, October 21st. At 8 p.m. At the Glasgow Technical College. Students' meeting. Inaugural Address by Mr. H. A. Mavor.

Manchester Association of Engineers.—Meeting on Saturday, October 22nd. Paper on "Water-Tube Boilers," by Mr. D. Wilson.

Junior Institution of Engineers.—Monday, October 24th. At 7 p.m. At the Royal United Service Institution, Whitehall. Annual general meetings of the Institution and Benevolent Fund.

Tuesday, October 25th. At 7.30 p.m. At Caxton House, Westminster. Lecture on "Law Relating to Engineering," by Mr. L. W. J. Costello. (Lecture II.)

Institution of Electrical Engineers (Manchester Local Section).—Friday, October 28th. At 7.30 p.m. At the Midland Hotel, Manchester. Opening meeting of the session. Address by Mr. J. S. Peck. Smoking concert.

Physical Society.—Friday, October 28th. At 5 p.m. At the Imperial College of Science, South Kensington. "Exhibition of a new Method for Producing High-Tension Discharges," by Prof. E. Wilson and Mr. W. H. Wilson.

Association of Engineers-in-Charge.—Saturday, October 29th. At 6 30 p.m. for 7 p.m. At Liverpool Street Hotel. Social, Ladies' night.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

THE following orders are announced :—

Commanding Officer—COL. R. E. B. CROMPTON, C.B.

Monday, October 24th.—"A" Company.
Tuesday, October 25th.—"B" Company.
Thursday, October 27th.—"C" Company.
Friday, October 28th.—"D" Company.
Hopkinson Cup Competition, at 7 p.m. Non-competitors of the Company competing may witness the competition.

(Signed) P. H. CAMPBELL, Capt. R.E., Adjutant.

NOTES.

The Olympia Electrical Exhibition, September-October, 1911.—An advance prospectus of this Exhibition and ground floor plan of the Hall at Olympia is being issued to the general trade this week by the business managers and organisers, International Trade Exhibitions, Ltd., Broad Street House, London, E.C. The duration of the event will be from September 23rd to October 21st. The Exhibition is the third promoted by the National Electrical Manufacturers' Association (Incorporated). The organisers will act under the direction of a Committee of leading manufacturers, assisted by an Advisory Committee interested in the electrical and engineering industries.

Careless Reviewing.—While a reviewer is perfectly at liberty to criticise a work according to his lights, it is but fair that he should take into consideration the intentions of the author, particularly when they are explicitly set forth. In a criticism of Mr. G. W. de Tunzelmann's new book ("A Treatise on Electrical Theory and the Problem of the Universe"), a reviewer in the *Athenæum* fails to conform to this condition, with the result that, in our opinion, he is somewhat unjust to the author. The review on the whole is not unfavourable to the work in question, which is an exhaustive account of the existing state of electrical theory from the physical point of view, and is intended to be of service to a wider circle of readers than those who are familiar with modern mathematical analysis. The author, however, has found it necessary occasionally to include sections of a more abstract and difficult nature, and for the guidance of the general reader, he has marked with an asterisk those chapters which are more suitable for his perusal.

The reviewer, although he notes the fact, considers the work too stiff for the general reader, and to illustrate his point he quotes a rather abstruse passage on the Hall effect, which occurs not in a chapter marked for the general reader, but in one of those chapters which he is warned off! We do not for a moment suppose that the reviewer consciously committed so flagrant an injustice to the author, but he obviously must have been very careless. Again, the reviewer accuses the author of labouring to prove a preconceived theory, because at the conclusion of a lengthy discussion on "the Place of Mind in the Universe," he sums up his arguments and illustrations with the remark that one thing "is now seen to be identical with" another, a statement which the reviewer regards as "by no means self-evident." The author, however, no more suggests that it is "self-evident" than Euclid suggests that one of his theorems is self-evident when he appends the "quod erat demonstrandum" to his proof. A reviewer should above all preserve a judicial frame of mind, and refrain from attributing to the author claims which the author has not made.

Appeal.—On Wednesday, in the Second Court of Appeal, the appeal by the plaintiffs in the action of Donnersmarckhuttes Oberschlesische Eisen und Kohlenwerke Actien Gesellschaft *v.* the Electric Construction Co., Ltd., relating to a patent for driving rolling mills electrically, was being heard.

Colliery Fatality.—In the Hamilton Sheriff Court on Friday last, Sheriff Thomson and a jury inquired into the circumstances attending the death of Thomas Aitken, a miner in the Home Farm Colliery, Forniegair, whose duty it was to act as a machineman in connection with an electric coal-cutter of the disk type. Robert M'Phail, electrical engineer, the Grange, Larkhall, said he made a minute examination of the coal-cutting machine on the morning following the accident. As a result, he had to report that there was nothing wrong with the machine. There were no leakages in the mechanism or in the cables. Two days following the fatality they experienced a breakdown with the machine, but it was not an electrical breakdown. There was absolutely no evidence whatever to lead him to believe that electricity was the cause of the accident. In reply to Mr. Robert M'Laren, H.M. Inspector of Mines, witness said they had such a complete system of earthing at the colliery that if there had been any leakage at all in the machine, it would have gone through the earthing wire and been indicated. It was his opinion that the accident was not caused by an electrical shock at all, but that it was due to Aitken being crushed by the haulage rope. The Sheriff at the close of the inquiry was directing the jury to return a verdict that Aitken died from electric shock, when Mr. M'Laren objected on the ground that such a verdict would not be in accordance with the evidence led. He thought the bulk of the proof had been most clear and explicit that Aitken was killed through being drawn in between the skid and the haulage rope, and that the latter so jammed him that his neck was broken. Sheriff Thomson said that if the fatality was not due to electric shock, it must have been caused by some violence which would have left a distinct mark on the body. It was strange that no medical evidence had been led to clear up that point. Mr. M'Laren remarked that it was clear indeed that the man was crushed. Immediately after the accident the doctor certified that Aitken's neck was broken, but later on he suggested something about electrical shock. On hearing that there was such a suggestion, he (Mr. M'Laren) as Mines Inspector, had waited for three hours in the pit in order to have the Diamond coal-cutter thoroughly tested. A very minute and searching examination disclosed nothing wrong with the coal-cutter at all. The Sheriff instructed the jury to return a verdict to the effect that Aitken was killed while guiding an electric coal-cutting machine along the face. At the same time he remarked that the inquiry had been most unsatisfactory in so far as there had been no medical evidence in relation to the actual cause of death.

Ailsa Bruce Robertson.—Our Masonic readers will be pleased to hear that at the recent election to the Royal Masonic Institution for Girls, Mrs. Robertson's daughter was among the successful candidates. Our thanks are due to those of our readers who gave their votes to this cause, and we are asked by Mr. C. Wilson, who has worked hard on behalf of the daughter of his late colleague, to convey the thanks of Mrs. Robertson and himself to them also. The total number of votes polled for this case was 5,565.

Electricity in the Mill.—At the Manchester Engineering and Machinery Exhibition on Monday, the increased use of electricity in the textile industries was strongly advocated by Mr. Frank Nasmith, the well-known consulting engineer. He said that until quite recently the electrical engineer knew comparatively little about the textile industries, but there were many problems that the textile machinist had to face which could be dealt with efficiently by the electrical engineer. Vast sums of money were spent without much success in the endeavour to bring about spinning on the bare spindles of ring frames, until an electric motor was invented which brought about a great increase in production, a more regular yarn, better wound bobbins, and made bare-spindle spinning appear only a matter of a short time. That was one of numerous instances in which electricity had been of great benefit to the industry, and in pointing out several processes in which he believed electricity would soon be employed with advantage, he said one was the operation of picking by the propulsion of the shuttles across the looms. At present a great deal of power was wasted, but that waste could be avoided, and the shuttles kept continually under control instead of for but two-thirds of the journey, as at present, by an electrical device to propel the shuttles. Technical education had broken down many barriers, and he had every hope that in the near future an increased knowledge of the spinning and weaving industries would enable the electrical engineer to give very material and beneficial assistance to the textile machinist.

National Electrical Manufacturers' Association (Inc.).—The Committee of this Association a short time ago decided that in future, in addition to the ordinary annual general meeting of the Association, half-yearly meetings should be held, and that these should preferably be held in towns other than London, where the annual general meeting has to be held.

The first half-yearly general meeting was held on Tuesday, 11th inst., at the Midland Hotel, Manchester. Representatives were present from over 30 members, and letters were received from a considerable number of others regretting their inability to attend. The first matter taken was the amended articles of association. It has been felt for some time by nearly all the members that the old articles of association did not confine the management of the Association sufficiently to British manufacturers; Mr. Butler, of the Electrical Power Storage Co., Ltd., who was elected to take the chair, pointed out to the meeting the somewhat drastic alterations which had been made in the new articles of association, and proposed a resolution in favour of their being passed. This was duly carried, as was also the second resolution put by the chairman for the purpose of empowering the Committee to re-classify the existing members as soon as the new articles come into force. Manufacturing sections, consisting of members of the Association who manufacture similar goods, have recently been formed, and many points were decided on as to the constitution and management of such sections, the main object being the bringing together of competing manufacturers for the purpose of getting matters of common interest settled. It was generally anticipated that much good work would be done by these sections.

A resolution was passed regarding the desirability of joint action in view of the great increase in the number of exhibitions which are now being promoted, and this resolution, together with one relating to the formation of a co-operative exhibit by members of the Association at the Turin Exhibition, was agreed to.

The last item on the agenda related to the action of certain municipalities which were out-stepping the bounds of merely using their shops as repairing shops, and were doing a certain amount of manufacturing. In view of this, it was considered very desirable that the Association should have a distinct policy on this subject, and a resolution was passed to the effect that extended powers for manufacturing and trading purposes should not be granted to local authorities. We are informed that the meeting proved to be a very great success, as great interest was taken by those present in the proceedings, and this experiment of the Committee will undoubtedly be regularly repeated in the future. We learn that the result of the recent more active work of the Association is a great increase in its strength, for not only has the membership nearly doubled in the last 12 months, but most of the new members being large firms, the capital represented by the members of the Association is now some three or four times as large as it was.

Opto-Technical Institute.—A proposal is on foot for the establishment of an Opto-Technical Institute in Clerkenwell, to carry on more advantageously the excellent work which has already been done in this connection by the Northampton Polytechnic Institute.

Copper.—The rate of reduction of the visible supply stocks appears to be growing brisker, to judge by the statistics given in Messrs. Merton's circular for mid-October. The reduction during the fortnight was 1,799 tons, against an average for seven months of 2,785 tons per month. The reduction for September was 3,545 tons, or about the same rate. French stocks have only decreased 236 tons, the remainder being withdrawn from English ports. The figures for afloat from Chile and Australia are 250 tons higher than for the end of the month: the depletion is thus more than the difference between the two returns. Supplies for the half-month are apt to be misleading; still, they are of interest as an indication. For the first half of October North American supplies are low, Spanish decidedly above the average, shipments from Chile on the average, and Australia slightly above. Deliveries are normal to the last four months, though, of course, higher than the figures preceding June.

Institution Notes.—Institution of Electrical Engineers (Manchester Section).—On Friday evening last a conversazione was held in connection with the Manchester Section of the Institution in the Whitworth Institute, Manchester. Mr. J. S. Peck, chairman of the Section, together with Mrs. Peck, and Mr. S. Z. de Ferranti (president elect) and Mrs. de Ferranti, received the guests, after which a very enjoyable evening was spent. A good vocal and instrumental programme had been arranged, which was well rendered by the artistes and much appreciated by the audience. There were about 300 members and friends present, including Dr. J. E. Petavel, Messrs. S. L. Pearce, T. L. Miller, M. B. Field, Miles Walker, C. H. Wordingham, S. J. Watson and C. H. Fox (President of the Manchester Association of Engineers). The conversazione was a decided social success, and from remarks made by many of those present, it is hoped that it will become an annual affair.

Illuminating Engineering Society (U.S.A.).—The fourth annual convention is being held on October 24th and 25th at Johns Hopkins University, Baltimore. The Society now has a membership of 1,600. The following papers are to be presented:—

E. B. Rosa and E. B. Crittenden, Bureau of Standards.—"Report of Progress on Flame Standards."
John F. Gilchrist.—"Practical Value of Illuminating Engineering to the Central Station."
W. J. Serrill.—"The Value of Illuminating Engineering to the Commercial Man."
J. S. Codman.—"Illuminating Engineering Sheets for the Calculation and Recording of Data."
C. F. Oehlmann.—"Central Station Illuminating Engineering Department Work and Methods Applied by the Denver Gas and Electric Co."
Norman Macbeth.—"The Relations Between Pressure and Light Output with Various Gas Lamps and Burners."
J. G. Felton and E. J. Brady.—"The Temperature Rise Due to the Energy Radiated in the Lower Hemisphere from Different Light Sources."
Dr. Herbert E. Ives, National Electric Lamp Association.—"Some Spectral Luminosity Curves Obtained by Flicker and Equality of Brightness Photometers."
Preston S. Millar, New York Testing Laboratories.—"An Unrecognised Aspect of Street Illumination."
Prof. S. O. Mast.—"The Effect of Light on the Movement of Lower Organisms."
V. R. Lansingh.—"The Value of Illuminating Engineering to the Manufacturer."

A course of 36 lectures on the science and art of illuminating engineering has been arranged to follow the proceedings during the year 1910-11.

Institution of Electrical Engineers (Glasgow Local Section).—To-night, Mr. H. A. Mavor delivers his inaugural address as chairman of the Students' Section at Glasgow, and on Friday, November 8th, the chairman of the General Section, Mr. Sam Mavor, delivers his opening address in the Lecture Hall, 207, Bath Street, Glasgow.

Institution of Electrical Engineers (Newcastle Local Section).—The first meeting of the session takes place on Monday, October 31st, at 8 p.m.

Institution of Electrical Engineers (Manchester Local Section).—The following is the provisional syllabus of this Section for the coming session :—

October 28th.—J. S. Peck, M.I.E.E., Chairman's Address.
November 8th.—C. F. Smith, M.Sc., M.I.E.E., "Irregularities in the Rotating Field of the Polyphase Induction Motor."
November 22nd.—A. B. Mallinson, A.M.I.E.E., "The Conditions Affecting the Life of Electrical Machinery."
December 6th.—Dr. E. Rosenberg, M.I.E.E., "The Methods of Braking in Electric Winding Engines."
December 20th.—K. Faye-Hansen, A.M.I.E.E., and G. Harlow, Student, "Merz-Price and other Discriminative Protective Apparatus for A.C. Circuits."
January 17th, 1911.—Harold Gray, A.M.I.E.E., "Electric Heating as Applied to Cooking Apparatus."
January 31st.—A. G. Collis, A.M.I.E.E., "Breaking High and Low Potential Circuits."
February 14th.—A. P. M. Fleming, A.M.I.E.E., and R. Johnson, A.M.I.E.E., "Pertinent Features in the Insulation of Electrical Machines."
February 24th.—Annual Dinner.
February 28th.—C. J. Beaver, M.I.E.E., "Heating Effects in Cables."
March 14th.—H. A. Ratcliff, A.M.I.E.E., and A. E. Moore, A.M.I.E.E., "Electricity Meters."
March 28th.—Annual General Meeting. Lecture by Prof. J. A. Fleming, D.Sc., F.R.S., M.I.E.E.

The programme of the Manchester Students' Section :—

November 1st.—Supper and Smoking Concert.
November 15th.—Allan Monkhouse, "Recent Electric Locomotive Practice and the H.T. Direct-Current Railway System."
November 29th.—H. A. Carney, "What's Wrong with the Electrical Industry and How to put it Right—on Paper."
December 13th.—Discussion.
January 10th.—G. D. L. Horsburgh, "Large Gas Engines."
January 24th.—H. T. Warner, "Switchboard Measuring Instruments."
February 7th.—A. K. Bentley and B. Hoyle, "Wireless Telegraphy."
February 21st.—O. Welch and A. E. Dent, "Sub-station Practice."
March 7th.—W. Roylands Cooper, "The Development of the Diesel Oil Engine."
March 21st.—Annual General Meeting.

The Electro-Harmonic Society.—To-night at 8 o'clock the twenty-fifth season of this Society opens with a smoking concert in the King's Hall of the Holborn Restaurant. Mr. S. Z. de Ferranti, president of the I.E.E., will be in the chair, and as it is the first large and representative gathering of electrical men—technical and commercial—everybody electrical will be wanting to take advantage of so admirable an opportunity of meeting everybody else. We observe an important reminder at the foot of the preliminary programme card that "no unoccupied chair may be retained after 10 minutes to 8 o'clock." The programme for the evening is as follows:—Glees, part songs, solos and duet—The Vocal Quartette, Messrs. George May, Frank T. Webster, George Stubbs and Harry Stubbs; humorous recitations, Mr. Walter Churcher; humorous and musical sketches, Mr. Astley Weaver; ventriloquial sketches, Mr. Sidney Gandy; solo violin, Mr. T. E. Gatehouse; solo pianoforte and accompanist, Mr. William Every, F.R.C.O., L.R.A.M. For the sake of non-members who may desire to enter the dates of the later concerts of the season in their diary of engagements, we print the following list as issued by the hon. secretary, Mr. W. E. Lane :—

Ladies' night	... ...	Monday, November 21st, 1910
Smoking concert	... ...	Friday, December 16th, 1910
" "	... ...	Friday, January 13th, 1911
Ladies' night	... ...	Tuesday, February 21st, 1911
Smoking concert	... ...	Friday, March 24th, 1911

The Press Campaign.—It is to be regretted that, in the headlong haste of modern journalism, even the more staid and reputable papers are liable to be imposed upon by innocent-looking paragraphs, which, in spite of their harmless appearance, carry concealed weapons and deal underhand blows which are made to appear to emanate from the Editorial pen. Thus, the *Pall Mall Gazette* of October 14th contains an item purporting to describe the new lighting, heating and ventilating equipment of the premises of the Royal Society of Medical Officers of Health, but headed "Gas *v.* Electric Light." The note states that "it is a fresh blow to the electric light movement that the Society has transferred its affections back to gas." "A fresh blow"—the expression is unmistakably the work of a writer who wishes to discredit electric lighting, and to convey the impression that it has lately endured a series of such blows. The composition of the note relieves our contemporary of all suspicion of having perpetrated it, even apart from its polemical tenor; but we could wish that such paragraphs were more carefully examined and sub-edited before they were accepted for insertion.

It is amusing to note that the necessity of carrying off the foul emanations of a large "ventilating" gas lamp in the main lecture hall is ingeniously made to appear an advantage, for "the shaft provided for the light carries off a steady draught of air, and this is entirely independent of a new system of ventilation of the utmost ingenuity." "A huge supply of filtered air . . . floods the upper part of the room, and is carried off noiselessly by a fan which works without effect of draught and disposes of 40,000 cb. ft. per hour."

Seeing that so efficient a system of ventilation is provided, it is obvious that the services of the gas lamp must be entirely superfluous as regards the general ventilation, and that the chimney is provided solely to remove the products of its combustion. We happen to know that the "new system of ventilation of the utmost ingenuity" is operated with the aid of *electric fans*.

The ventilated gas lamp above-mentioned is turned on and off with a switch "as easily as electric light," and, therefore, except for the unfortunate necessity of a chimney, it is nearly as good as an electric lamp.

But the general idea embodied in the note is that the whole of the electric lamps throughout the building have been replaced by gas lamps. Now this is incorrect, for in only one room, we understand, has gas been installed. The rest of the building is still lighted by electricity. A sub-head to the note reads, "The Verdict of Medical Officers." That verdict, interpreted in the light of the actual facts, is clearly in favour of lighting by electricity everywhere except in their lecture hall, and of ventilating with electric fans. Anyone but a gas fanatic would surely regard this as a blow to gas, not to electricity. Our contemporary has been "let in."

Appointments Vacant.—Engineer to take charge at the West Ham Borough Asylum, Goodmayes (£150); manager, for the Aberdare U.D.C. Electricity Department (£200); mechanical engineer for the electric light station under the Public Works Department of Southern Nigeria (£250 per annum +). See our advertisement pages in this issue.

Nitrogen Works in Norway.—One of the largest works for the utilisation of water power in connection with the fixation of nitrogen in Norway, is situated at the Rjukan Falls, which are to be worked by the A. S. Rjukan Saltpetre Works Co., which is now proceeeding to install the plant. German capital and industry, including the Baden Aniline and Soda Works, are interested in the undertaking to a predominant extent. It is proposed to transmit power from the generating station at the falls to the amount of 200,000 H.P. to the nitrate factory which is about 3·1 miles distant, and the switchboard work has just been entrusted to the Siemens-Schuckert Works. The overhead conductors are of aluminium, and have been furnished by the Heddernheim Copper and South German Cable Works Co., of Frankfort-on-Main.

Personal.—We desire to call the attention of those of our readers who belong to the Electro-Harmonic Society to the advertisement of Mrs. Alfred Izard which appears elsewhere in this issue, under "Miscellaneous."

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—The Salford T.C. has appointed Mr. L. Romero as mains engineer, at a salary of £180 per annum, rising by £10 every two years to a maximum of £230.

The staff at the Stoke-on-Trent Electricity Works on Friday presented a silver-plated tantalus set and a Thermos flask to Mr. P. J. S. Tiddeman, engineer and manager, who is leaving.

Bury Town Council on October 8th appointed Mr. J. G. Potts, one of the shift engineers at the electricity works, to be clerk of works at the new power station.

Mr. R. Parry, of the Leeds electricity undertaking, has been appointed junior shift engineer to the Bridgend (Glam.) Electric Light and Power Station.

Mr. V. J. Allen, shift engineer at the Kent Electric Power Co.'s Frindsbury Power House, Strood, Kent, has resigned, having been appointed shift engineer at Southampton Corporation Electricity Works. Mr. E. E. Hamar has been appointed to fill Mr. Allen's position, and Mr. F. W. T. Bradley has been promoted to Mr. Hamar's position.

General.—On the occasion of his marriage, Mr. Chas. Ford, of the staff of the St. Helen's Cable and Rubber Co., Ltd., Warrington, has been presented with a marble clock and Marli horses by the manager and staff of the company.

The employés of Messrs. Ashton & Holt, electrical engineers, of Ryde (I. of W.), have presented a clock to Mr. Fredk. B. Holt, a member of the firm, on his marriage.

Mr. J. N. Bailey, of the British Westinghouse Electric and Manufacturing Co., Ltd., has been awarded by the Manchester Association of Engineers the Constantine Gold Medal for the best paper read during the year. Mr. Bailey's paper, which was read during the Session 1909-10, was entitled "The Exhaust Steam Turbine."

We understand that Mr. J. M. M. Munro, of Glasgow, the founder of the well-known firm of Anderson & Munro, finding it increasingly difficult to carry on his extensive consulting practice whilst interested also in a contracting business, has decided to sever his connection with the latter, and to devote himself wholly to consulting work. Mr. Munro, as many of our readers must be aware, is one of the pioneers of electric lighting and power; he carried out the lighting of Lord Kelvin's house, the first in the world, it is said, to be fitted throughout with electric light as the sole illuminant, and laid down a light electric railway at Carstairs, the first in Scotland, supplied with power from a waterfall five miles away, besides devising innumerable inventions, and advising in many important lighting and power schemes. His wide experience will stand him in good stead, and we wish him success in his new *rôle*.

Obituary.—We regret to record the death of Mr. Henry Graham Harris, M.Inst.C.E., M.I.E.E., M.I.M.E., consulting engineer, of Westminster, who passed away suddenly on October 12th, after a short illness. Mr. Harris's association with the late Sir Frederick Bramwell in the firm of Bramwell & Harris will be remembered by most of our readers. During the period of that association he was connected with a number of electrical undertakings in different parts of the country. The deceased gentleman was 60 years of age.

NEW COMPANIES REGISTERED.

New Development Co., Ltd. (112,145).—This company was registered on October 12th, with a capital of £5,000 in £1 shares, to promote, finance, subsidise and assist companies, syndicates and partnerships carrying on or intending to carry on electric light or other electrical or kindred undertakings, to acquire, hold and deal in shares in such concerns, and to carry on the business of an electric light or supply company, &c. The subscribers (with five shares each) are:—W. Allnut, Hamilton House, Victoria Embankment, E.C., shipping clerk; E. H. F. Reeves, Salisbury House, E.C., secretary. Private company. The subscribers are to appoint the first directors; qualification, five shares. Registered office, Bedford Circus, Exeter.

Perry & Lawson, Ltd. (112,111).—This company was registered on October 10th, with a capital of £1,000 in £1 shares, to carry on the business of electricians, engineers, manufacturers of, and dealers in, electrical apparatus, &c., and to adopt an agreement with G. Lawson and W. P. Perry. The subscribers (with one share) are:—W. P. Perry, Glenavon, Woodfield Avenue, Penn, near Wolverhampton, engineer; G. Lawson, 47, Edith Road, West Kensington, W., engineer. Private company. The number of directors is not to be less than two or more than five; the first are G. Lawson and W. P. Perry; qualification, £50. Registered office, Prudential Buildings, Market Place, Wednesbury, Staffs.

Auto-Electric Vacuum Drying Syndicate, Ltd. (112,114).—This company was registered on October 11th, with a capital of £2,000 in 10s. shares, to carry on the business indicated by the title, and to adopt an agreement with T. J. Rorke, J. Thame, E. Rorke, H. S. Benson, and R. G. Orr. The subscribers (with one share) are: F. R. Graves, 709, Salisbury House, E.C., secretary; H. W. Wood, 27, Eversley Road, Charlton, S.E., clerk. Private company; the first directors are not named; remuneration according to profits. Registered by Maxwell & Dampney, 41, Bishopsgate Street Within, E.C.

CITY NOTES.

Cleveland and Durham Electric Power, Ltd.

The directors have issued a circular to their shareholders calling an extraordinary general meeting to be held at Newcastle-on-Tyne on 25th inst., when resolutions will be proposed for the reduction of the capital of the company from £1,000,000 to £700,000, by cancelling capital lost or unrepresented by available assets to the extent of:—

(1). £5 per share on each of the 1,081 deferred shares, numbered 44,851 to 45,931 (both inclusive) which are held in trust for the company for the purpose of surrender. (Such shares to be wholly cancelled.) (2) £4 10s. per share on each of the remaining 58,311 issued deferred shares numbered as follows:—1 to 43,174 (both inclusive), 43,317 to 44,850 (both inclusive), and 45,932 to 59,534 (both inclusive). Such shares to be reduced in nominal amount to shares of 10s. each. (3) £1 per share upon each of the 32,111 issued ordinary shares, numbered 1 to 32,111 (both inclusive), such shares to be reduced in nominal amount to shares of £4 each. By cancelling 15 of the unissued deferred shares, and sub-dividing one of the remaining unissued deferred shares into 10 shares of 10s. each, and cancelling 9 of such 10 shares, the remaining 10s. share to be called a "deferred half share."

Upon such reduction taking effect it is proposed to make the following further alterations in the shares of the company:—

(a) That each of the 66,741 issued preference shares and of the 3,259 unissued preference shares be divided into five shares of £1 each. (b) That each of the 32,111 issued ordinary shares be divided into four shares of £1 each, and that each of the 37,889 unissued ordinary shares be divided into five shares of £1 each. (c) That the 58,311 shares of 10s. each resulting from the reduction of the 58,311 issued deferred shares be consolidated into shares of £1 each, but so that in the case of holdings of an uneven number, the share bearing the highest number be excepted from the consolidation, and that the shares so excepted be thenceforward called "deferred half shares." (d) That each of the 591 unissued deferred shares remaining after the reduction aforesaid be divided into five shares of £1 each.

Drake & Gorham, Ltd.—The directors' report for the year ended June 30th, 1910, states that after payment of all charges, including bonuses due to staff, there remains a net profit of £5,758, which, with £485 brought forward from the previous year, makes a total of £6,242, which it is proposed to appropriate as follows:—A dividend at the rate of 4 per cent. per annum £5,000, carrying forward £1,242. The number of installations carried out during the past year shows an increase, but owing to the economy effected by the use of metallic-filament lamps, the average cost per installation is lower. The large increase in turnover of the department for supplying the trade is a satisfactory feature in the year's record.

Ferranti, Ltd.—The directors' report for the year to June 30th, 1910, states that the profit on trading was £41,236, and, after crediting discounts, interest and transfer fees, and deducting general establishment charges, repairs and renewals, legal expenses, bad debts, and directors' and trustees' fees, there remains a balance of £17,392, which has been applied as follows:—Interest on prior lien debentures £817, interest on first mortgage debenture stock £5,000, interest on bank loan £1,084, amount charged in respect of depreciation £7,500, leaving a balance of £2,991. The balance standing at the debit of profit and loss account on June 30th, 1909, has been deducted, leaving an amount of £1,162 to the credit of profit and loss account at June 30th, 1910. The results for the year show an improvement over those of the previous year, and the depreciation allowance has been increased from £5,000 to £7,500.

City of Birmingham Tramways Co., Ltd.—A dividend of 10 per cent. per annum for the nine months ended September 30th, 1910, is announced.

Cuba Submarine Telegraph Co., Ltd.—The directors' report for the half-year ended June 30th last states that the total receipts of the six months were £20,176, while the expenses amounted to £6,200, leaving a balance of £13,976, plus £7,221 brought forward, giving a total of £21,197 to be dealt with; £4,000 has been placed to the reserve against loss on investments, and £2,000 added to the reserve fund, which now stands at £118,000. The dividend on the preference shares will absorb £3,000, and leave £12,197, out of which the directors recommend the payment of a dividend at the rate of 6 per cent. per annum on the ordinary shares, free of income-tax; the balance, £7,397, being carried forward. The cables continued in good working order throughout the half-year.

Hurst, Nelson & Co., Ltd.—The report as abstracted in the *Financial News* for the year ended July 16th, 1910, shows a gross profit of £32,897, which, with £6,171 brought forward, makes a total £39,068. The following are then deducted:—Income-tax and interest, £2,633; depreciation on works, machinery, plant, and wagon stock, £13,606; portion of expenses forming the company, £1,200; total, £17,439; leaving a balance at credit of profit and loss account of £21,628. Out of this there have been paid interim dividends on the preference share capital from July 17th, 1909, till May 15th, 1910, at the rate of 6 per cent. per annum, less income-tax, £9,348, leaving a balance of £12,279. The directors recommend a dividend at the rate of 6 per cent. per annum on the preference share capital from May 15th to July 16th, 1910, less income-tax, £1,919; to special reserve fund for security of dividend on preference share capital, £419; in payment, on November 11th, 1910, of a dividend on the ordinary share capital at the rate of 5s. per share, free of income-tax, £3,000; carrying forward to the credit of profit and loss account, £6,941.

Monte Video Telephone Co., Ltd.—The directors' report for the year ending July 31st last, shows, after providing for all charges in Monte Video and London, a net profit for that period of £20,564, as against £19,931 for the previous year. The interim dividends paid on May 1st last absorbed the sum of £4,343, leaving a balance of £16,222 plus £3,042 brought forward, making an available balance of £19,264. After applying £11,000 to depreciation of the company's property and plant, the directors recommend the payment of final dividends of 2½ per cent. upon the preference shares, and 3 per cent. upon the ordinary shares, making for the year 5 per cent. on the preference, and 6 per cent. on the ordinary shares, leaving a balance of £3,921 to be carried forward. There has been a further satisfactory increase during the year in the number of subscribers and in revenue.

Stock Exchange Notices.—Application has been made to the Committee to appoint a special settling day in:—

United River Plate Telephone Co., Ltd.—Further issue of 40,000 ordinary shares of £5 each. £3 10s. paid.

And to allow the following to be quoted in the Official List:—

Montreal Water and Power Co.—Further issue of £25,000 4½ per cent. first mortgage prior lien gold bonds of £100 each (Nos. 2,812 to 3,017, 3,058 to 3,061 and 3,088 to 3,127).

Companies Struck off the Register.—The following companies have been struck off the register, and are accordingly dissolved:—

Dorchester Electric Light and Power Co., Ltd.
Electric Vehicles Development Co., Ltd.
Foreign Chemical and Electrolytic Syndicate, Ltd.
Lancashire and Cornish Boiler Syndicate, Ltd.
Macclesfield Tramways Syndicate, Ltd.
Newark Electric Supply Co., Ltd.
Ozone Purification Co., Ltd.
Railway and Tramway Concessions Syndicate, Ltd.
Sedneff Batteries, Ltd.
Ystradgynlais Electric Lighting Co., Ltd.

Callender's Cable and Construction Co., Ltd.—The directors have decided to pay an interim dividend of 5s. per share, being at the rate of 10 per cent. per annum on the ordinary shares, less income-tax at 1s. 2d. in the £. The books will be closed from 22nd to 31st inst., both days inclusive, for the preparation of the dividend warrants, which will be payable on and after November 1st next.

New St. Helens and District Tramways Co.—The report states that the profit for the year to June 30th, including £547 brought forward, is £1,589. The directors recommend a dividend on the preference shares at the rate of 1½ per cent. per annum, leaving £390 to carry forward.

Prospectus.—*Pachuca Light and Power Co.*—The list is to close to-day in an issue of £800,000 5 per cent. first mortgage 50-year bonds at 88½ per cent., the principal and interest being unconditionally guaranteed by the Mexican Light and Power Co., Ltd.

Continental.—Belgium.—La Société de la Manufacture de Cables, Accumulateurs et Appareils Electriques, of Seneffe, is declaring a dividend of 5 per cent. for the last financial year.

Montreal Light, Heat and Power Co.—A dividend of 1¾ per cent. on the paid-up capital stock (being at the rate of 7 per cent. per annum) for the quarter to the 31st inst. is announced.

Bank Rate.—The Bank Rate was yesterday increased from 4 to 5 per cent.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight.		No. of wks.	Total to date.		Route miles open.	
		£*			£	£*		Inc.
Aberdeen	Oct. 12	2,773	+ 33	19	29,213	— 35	..	..
Ayr	„ 15	436	+ 15	22	8,873	+ 346	8	..
Bath	„ 15	1,660	+ 90	41	34,230	+ 1,890	..	..
Belfast	„ 14	8,461	+ 628	28	114,895	+ 5,818	37	..
Birkenhead	„ 16	2,042	— 14	28	31,790	+ 703	13·68	..
†Birmingham Corp.	„ 1	7,384	+ 308	26	177,350	+ 2,647	56·79	..
Blackburn	„ 12	2,242	+ 76	28½	31,562	— 1,098	14·12	·12
Blackpool Corp.	„ 13	2,101	+ 445	..	46,008	+ 2,819	..	..
Blackpool-Fleetw'd	„ 15	1,078	+ 215	15	20,789	+ 1,049	..	..
†Bolton	„ 16	2,314	— 15	29	68,721	+ 80	26	..
Bournemouth	„ 12	3,303	+ 134	27½	55,976	+ 4,785	21·95	..
Bradford	„ 8	11,121	+1,196	28	142,790	+ 5,457	54·81	..
Brighton	„ 16	1,964	+ 63	28½	30,856	+ 240	9·5	..
Bristol	„ 14	12,013	+ 860	..	..	..	..	..
Brit. Elec. Trac. Co.								
Airdrie	„ 7	474	+ 2	40	8,792	+ 61	3·65	..
Barnsley	„ 7	363	+ 27	40	6,936	+ 191	..	..
Barrow	„ 7	527	+ 50	40	10,928	+ 1,536	5·37	..
Cavehill	„ 7	186	+ 8	40	3,794	+ 171	..	..
Devonport	„ 7	897	+ 151	40	17,210	+ 2,431	8·85	..
Gateshead	„ 7	2,121	+ 58	40	39,659	— 87	11·25	..
Gravesend	„ 7	449	— 3	40	8,427	— 90	6·5	..
Greenock	„ 7	1,262	+ 34	40	25,498	+ 3,038	7·25	..
Hartlepool	„ 7	525	+ 29	40	10,185	+ 662	6·72	..
Kidderminster	„ 7	240	+ 36	40	4,598	+ 150	..	..
‡Leamington	„ 7	330	— 56	40	6,868	— 307	..	..
Merthyr	„ 7	424	+ 16	40	8,370	— 198	2·9	..
Metropolitan	„ 7	16,626	+3,703	40	302,426	+52,622	22	..
Middleton	„ 7	651	— 16	40	12,862	— 790	8·5	..
Mid. Joint Com'tee	„ 7	12,796	+ 576	40	242,528	+ 3,428	..	..
Oldham—Ashton	„ 7	1,148	— 10	40	22,386	— 147	9·13	..
Peterborough	„ 7	334	+ 21	40	4,779	— 55	5·31	..
Potteries	„ 7	3,960	+ 165	40	70,566	— 655	29	..
Rothesay	„ 7	555	+ 78	40	9,631	+ 134	2·75	..
Southport	„ 7	607	+ 46	40	12,167	+ 225	8·17	..
S. Metropolitan	„ 7	1,852	+ 207	40	33,676	+ 1,311	..	..
Swansea	„ 7	2,223	— 13	40	43,738	+ 4,638	12·5	..
Tynemouth	„ 7	465	+ 19	40	10,928	+ 561	3·75	..
Weston-s-Mare	„ 7	257	+ 28	40	6,819	+ 15	3	..
‡Worcester	„ 7	618	+ 29	40	11,599	+ 256	5·75	..
Wrexham	„ 7	228	+ 26	40	3,943	— 52	..	..
Yorks. Wool. Dist.	„ 7	2,134	+ 170	40	39,820	+ 3,115	17	..
Miscellaneous	„ 7	423	+ 1	40	8,791	+ 315	..	..
Burnley	„ 15	2,677	+ 67	..	..	..	11·1	1
Burton-on-Trent	„ 16	561	— 27	28	7,940	+ 128	6·62	..
†Bury	„ 9	1,182	— 18	..	33,072	— 315	22·5	..
†Cardiff	„ 8	2,290	+ 131	28	63,636	+ 693	..	..
Carlisle	..	..	..	..	..	..	..	..
Chatham and Dist.	„ 13	1,960	+ 94	41	35,484	+ 1,313	14·98	..
Cork	„ 13	1,001	— 32	41	20,250	+ 1,646	9·9	..
Croydon	„ 7	3,595	+ 150	..	47,123	+ 3,461	11·25	..
Darlington	„ 15	419	+ 52	29	5,835	+ 429	..	..
Darwen	„ 7	510	+ 15	27	6,832	— 206	4·36	..
Dover	„ 8	480	+ 53	27	6,612	+ 218	4·75	..
Dublin	„ 14	10,905	— 78	..	90,335	+ 1,533	54·5	..
Dundee	„ 12	2,571	+ 61	21⅔	26,616	+ 506	15	..
East Ham	„ 15	2,196	+ 114	28⅓	29,939	+ 1,058	8.52	..
†Exeter	„ 14	328	+ 13	28	9,580	+ 695	5·5	..
Glasgow	„ 15	37,829	+2,209	..	353,071	+20,082	97·75	3·25
Hastings	„ 13	2,020	— 4	..	..	..	..	..
Huddersfield	„ 15	3,556	+ 166	29	50,495	+ 2,420	28·5	..
Hull	„ 15	6,867	+ 299	28	77,950	+ 3,935	14·5	..
Ilkeston	„ 13	274	+ 7	28	3,706	— 186	..	..
†Ipswich	„ 8	450	+ 51	27	12,605	+ 704	10·5	..
Kilmarnock	„ 8	317	+ 19	21	3,319	+ 107	4·25	..
Lancashire United	„ 12	2,713	+ 130	..	54,209	— 429	30	..
Leeds	„ 8	14,853	+ 944	27	195,886	+ 6,575	..	..
Leicester	..	..	..	..	..	..	..	..
†Leith	„ 15	593	— 10	..	14,194	+ 109	8·7	..
Liverpool	„ 8	22,729	+ 642	40½	446,905	+15,661	113·5	4
‡L.C.C.	„ 5	86,048	+8,235	..	1,134,133	+123,358	132·5	6·5
London United	„ 15	12,814	+ 904	..	259,071	+11,955	..	..
Lowestoft	..	..	..	..	..	..	..	..
Manchester	„ 15	31,313	+ 914	28	440,331	+ 8,404	183	1
Newcastle	„ 15	7,901	— 42	..	112,624	+ 1,084	14·5	..
Newport	„ 8	1,393	+ 53	28	19,489	+ 780	14·5	..
Oldham	„ 16	3,733	+ 18	29	54,597	— 903	23·75	..
Pontypridd	..	..	..	..	..	..	..	..
Portsmouth	„ 8	4,301	+ 90	27	61,511	— 1,382	15½	..
Preston	„ 12	1,467	— 56	28	20,854	— 416	..	..
Rotherham	..	..	..	..	..	..	..	..
†Salford	„ 10	4,748	+ 131	27½	130,539	+ 2,252	..	..
Sheffield	„ 16	12,340	+ 405	29⅔	175,673	+10,099	40	·25
Southampton	„ 12	2,259	+ 76	28	31,905	+ 748	..	..
Southend-on-Sea	„ 12	1,172	+ 222	28	19,217	+ 2,211	..	..
South Shields	„ 15	1,123	+ 8	28⅔	16,459	+ 27	..	..
†Swindon	„ 12	154	+ 8	..	4,103	+ 170	..	..
Tyneside	„ 12	810	— 6	15	7,083	+ 320	..	..
Wallasey	„ 1	1,900	+ 5	26⅔	26,074	+ 236	..	..
†Walthamstow	„ 8	745	+ 105	27	20,507	+ 1,425	9	..
West Ham	„ 6	5,178	+ 464	27	67,811	+ 3,138	15·25	·12
Wolverhampton	„ 12	1,960	+ 36	28	26,787	+ 3,259	14·25	1·75
Cen. London Rly.	„ 15	11,144	+ 118	15	79,874	+ 4,045	6·32	..
City & S. Lon. Rly.	„ 16	6,256	— 6	15	46,257	+ 159	7·26	..
Dublin-Lucan Rly.	„ 14	286	+ 4	15	2,589	+ 130	7	..
G.N. and City Rly.	„ 15	2,910	+ 78	15	19,930	+ 669	3·5	..
L'pool Overh'd Rly.	„ 16	2,723	+ 119	..	23,377	+ 441	6·8	4·8
Llandudno-Col. Bay	„ 14	438	+ 40	45½	13,842	+ 400	..	..
London Elec. Ry. Co.	„ 15	25,820	+ 470	15	176,290	+ 1,125	21·25	..
Mersey Railway	„ 15	4,032	+ 193	15	29,504	+ 446	4·5	..
Metropolitan Rly.	„ 16	34,172	+ 924	..	249,858	+ 7,695	24·5	..
Met. District Rly.	„ 15	21,780	+1,422	15	153,095	+ 9,511	24	..
Anglo-Argentine	„ 14	94,050	+10,504	..	1,819,336	+214,176	..	..
§Auckland	Sept.	14,595	+1,208	12½	45,368	+ 5,044	23·3	1
Bombay (B.E.T.)	Sept. 16	5,500	+ 439	37	99,754	+ 6,935	..	..
§Brisbane	Aug.	21,950	— 47	32	144,795	+13,548	..	..
§Brit. Columbia Rly.	..	..	..	..	..	..	..	..
Calcutta	Oct. 15	8,026	+ 943	..	..	..	..	..
§Cape Electric T.Ld.	..	..	..	..	..	..	..	..
§Kalgoorlie, W.A.	Sept.	4,212	..	..	32,228	..	20·5	..
Madras	Sept. 30	1,286	+ 22	..	24,322	+ 1,406	..	..
Montevideo	Sept.	21,360	+2,332	..	256,979	+25,096	..	..
§Lisbon	..	..	..	..	..	..	..	..
Perth (W.A.)	Oct. 14	2,578	— 139	..	50,908	+ 6,270	29	1

* Compared with the corresponding period of 1909. † One week only.
Includes horse, steam and other receipts § One month.

STOCKS AND SHARES.

Tuesday Evening.

Stock Exchange business remains good on the whole, with prices mainly in the ascendant, and orders steadily increasing in volume. The various alarms and excursions abroad, and the labour troubles at home, have been quietly put out of remembrance for the time being, and markets look forward to a fair run up to Christmas-time, which, by the way, is an expectation that takes no count of the contingencies inseparable to life at large. To pursue that alluring theme, however, would be to court the stern rebuke that moralisings—if not morals—fall outside the scope of a financial commentator. So back, as Pepys would have written, to our muttons.

Railway stocks of all kinds are greatly in favour at the present time, and the Home Railway market commands much public attention, together with a little public buying. Brighton Deferred stands out among the steam stocks for its display of strength. Metropolitan District has the best rise out of the electrical issues, the company issuing an excellent traffic statement for September. In view of this, the District 4½ per cent. First Preference stock at 80 appears to be a good speculative investment. For the first half of the current year the dividend was paid at the rate of 3 per cent. per annum, but something better should be forthcoming in respect of the present six months. Should the rate be made up to only 3½ per cent. for the full period, the yield would be nearly 4½ per cent. on money invested, with the good prospect of its increasing until the due 4½ per cent. is distributed.

Metropolitan Consolidated rose a point. City and South London sticks at 28, and the Central London trio has not moved save for a point fall in the Ordinary.

The absorption of really first-class securities goes on apace, heedless of the natural decline in Consols. There is money, and plenty of money, seeking investment, and the telegraph-telephone list is being scanned for stocks that give no risky yield, but which are safe and stable. Of the various issues quoted overleaf, we take the following as illustrations :—

Stock.	Dividend.	Price.	Yield.
Eastern Telegraph Preference	3½	84	£4 3 4
„ „ Debenture	4	103½	3 17 4
Eastern Exchange Debenture	4	101	3 19 3
East and South African Debenture	4	101½	3 18 10
National Telephone Debenture	4	100	4 0 0
Pacific and Europe Debentures	4	99	4 0 10
Western Telegraph Debenture	4	101	3 19 3

The Portuguese revolution has had a beneficial effect upon Anglo-Portuguese Telephone 5 per cent. Debenture stock, raising the price ½ to 103. Nor have the stocks and shares of the cable companies running to the West Indies been affected by the news of the terrible cyclone in Cuba. Havana Electric Railway 5 per cent. Consolidated Mortgage bonds are steady at about par. A violent rise in American Rails formed a good excuse for putting up the price of Anglo-American Telegraph Deferred. The Preferred at 107½, *ex* 1½ per cent. dividend, shows a decline of 1, and, as a 5½ per cent. speculative investment, cannot be considered expensive. Direct United States Cable shares have given way, a fall of 7s. 6d. being accounted for only as regards 4s. by the dividend deduction. Other changes are more or less insignificant. Telephone descriptions are colourless. American Telephone and Telegraph stock at 143½ has put on a point.

Electricity Supply shares remain in their normal habit of suspended animation. City of London Ordinary rose ⅛ to 11½, and this is the only change in the list of metropolitan shares. A rise to 225 in River Plate Electricity Ordinary stock represented a gain of 7½, but the 6 per cent. Preference has not recovered its fall of 5 last week. The Canadian-Mexican group displays considerable steadiness, the movements being small, though mostly upwards. Rio Trams rallied to 106½, *ex* 1½ dividend, while Sao Paulo shares keep in the neighbourhood of 152½. Para Electric Ordinary are 7⅛, the Preference 5¼ and the Debenture stock 99¼.

The industrial and manufacturing list presents few features of real interest. Rubber shares continue to monopolise the lion's share of attention in the Miscellaneous Market, and the prices of these have been jumping about like balls of the material itself. Castner-Kellners have scored most, with an advance to 3⅛. Babcock shares are better, and Brush Second Debenture rose a point. Edison & Swan "A" shares have sunk to the somewhat inglorious quotation of nothing-to-an-eighth. Dick, Kerr Ordinary and Preference, now quoted *ex* dividend, reflect the deductions in their prices.

There is not much doing in Traction stocks and shares. Anglo-Argentine Trams Second Preference have hardened slightly, and British Electric Traction Preference at 3¼ are firmer.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1906.	1907.	1908.	1909.	Closing Quotations Oct. 11th.	Closing Quotations Oct. 18th.	Business done week ended Oct. 18th, 1910. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	Nil	4¼ — 4⅝	4¼ — 4⅝	90/-	..	..	Nil.
266,500	Do. 5 % Deb. Red. Iss. at 98 % script all paid	Stock	5 %	5 %	5 %	5 %	95 — 97	95 — 97	96½	95⅞	..	4 17 7
255,196,000	American Telephone & Telegraph, Cap Stock ..	$100	8 %	8 %	8 %	8 %	141 —144	142 —145	144	..	+1	5 10 4
53,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	94 — 96	94 — 96	..	..	..	4 3 4
558,460	Anglo-American Telegraph	Stock	3⅞%	3⅞%	£3 4s.	3⅜%	66 — 68	66 — 68 xd	67½	..	..	5 6 7
3,220,770	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	6 %	107½—109½	106¼—108½ xd	108⅝	106½	..	5 10 7
3,220,770	Do. do. do. Deferred	Stock	1⅜%	1 %	8/-	25/-	26¼— 26¾	26⅜— 26⅝	26 13/16	26⅛	+ ⅜	4 12 9
47,725	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	5 %	101½—103½	102 —104	..	..	+1	4 16 2
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	8 %	9⅞— 10⅜	9⅞— 10⅜	10⅛	9 13/16	..	3 17 1
2,449,176	Commercial Cable, Stlng. 500 year 4% Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	84⅛— 86⅛	85 — 87	85⅞	85⅛	+ ⅛	4 12 0
16,000	Cuba Telegraph	10	5 %	6 %	6 %	6 %	8⅜— 9⅛	8⅜— 9⅛	..	..	..	6 6 4
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	16— 17⅝	16⅞— 17⅝	..	..	..	5 14 3
12,931	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	4 %	3⅜— 3⅝	3⅜— 3⅝	17	..	..	5 1 7
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	10 %	8⅝— 9	8⅝— 9	8⅞	..	..	5 11 1
30,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	101 —103	101 —103	..	..	..	4 7 5
60,710‡	Direct United States Cable	20	4⅜%	4½%	4½%	4 %	16⅛— 16⅜	15⅝— 16⅛ xd	..	..	..	4 18 6
36,000	Direct W. India Cable, 4½% Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	100 —102	100 —102	100½	..	..	4 8 8
4,000,000	Eastern Telegraph, Ord. Stock	Stock	7 %	7 %	7 %	7 %	132½—135½	130 —133 xd	134¼	131½	..	5 5 3
2,000,000	Do. 3½ % Pref. Stock	100	3½%	3½%	3½%	3½%	84 — 86	83 — 85 xd	85	83	..	4 2 4
1,896,706	Do. 4 % Mort. Deb. Stock Red. ..	Stock	4 %	4 %	4 %	4 %	102½—104½	102½—104½	104	103½	..	3 16 7
300,000	Eastern Extension, Australasia, and China Tele.	10	7 %	7 %	7 %	7 %	12⅝— 13	12¼— 12⅝ xd	12 31/32	12⅝	..	5 10 11
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	100 —102	100 —102	101½	..	..	3 18 5
200,000‡	East. & S. Afric. Tel., 4 % Mt. Db. Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	100½—102½	101 —103	101½	..	+ ½	3 17 8
181,127	Globe Telegraph and Trust	10	5⅛%	5⅞%	5⅝%	5⅞%	10⅛— 10⅜	10⅛— 10⅜	10 15/16	10⅛	..	5 9 5
181,127	Do. do. 6 % Pref.	10	6 %	6 %	6 %	6 %	13⅛— 13⅜	13⅛— 13⅜	13⅜	13¼	..	4 7 3
150,000	Great Northern Telegraph, of Copenhagen..	10	20 %	20 %	18 %	18 %	30¾— 31¼	30¾— 31¼	..	..	..	5 13 4
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	13 %	53 — 55	53 — 55	..	..	..	6 15 8
$41,380,400	Mackay Companies Common	$100	3½%	4 %	4 %	4½%	94 — 97	94 — 97	..	..	..	4 7 8
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	75 — 80	75 — 80	..	..	..	5 0 0
394,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	Nil	3/32 — 7/32	3/32 — 7/32	17/-	16/-	..	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	6 %	6 %	6 %	6 %	3/32 — 5/32	3/32 — 5/32	18/9	18/-	..	6 4 8
86,492	Do. do. do. 5 % Pref.	1	5 %	5 %	5 %	5 %	3/32 — 5/32	3/32 — 5/32	..	..	..	5 3 11
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	104⅛—105⅜	104⅛—105⅜	104½	..	..	5 13 9
3,725,000	Do. do. Def. Stock	100	5 %	6 %	6 %	6 %	121 —123	121 —123	121½	121	..	4 17 7
15,000	Do. do. 6 % Cum. 1st Pref.	10	6 %	6 %	6 %	6 %	10 — 10⅜	10 — 10⅜	..	..	..	5 11 8
15,000	Do. do. 6 % Cum. 2nd Pref.	10	5 %	6 %	6 %	6 %	10 — 10⅜	10 — 10⅜	..	..	..	5 11 8
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5 5/8 — 5 11/16	5 5/8 — 5 11/16	5 15/16	5⅝	..	4 9 11
2,000,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	98 —100	98 —100	98½	..	..	3 10 0
1,983,593	Do. do. 4 % Deb. Stock Red... ..	100	4 %	4 %	4 %	4 %	99 —101	99 —101	99⅛	..	..	3 19 3
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid..	1	7 %	8 %	8 %	8 %	1⅛ — 1⅛	1⅛ — 1⅛ xd	..	..	..	4 14 10
50,000	Do. do. do. 6 % Cum. Pref. ..	1	6 %	6 %	6 %	6 %	1⅛ — 1⅛	1 1/16 — 1⅛ xd	..	..	..	4 7 3
195,955	Do. do. do. 4 % Red. Deb. Stock..	100	4 %	4 %	4 %	4 %	87 — 89	87½ — 89½	88⅜	..	..	4 11 5
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	100	4 %	4 %	4 %	4 %	98 —100	98 —100	..	..	..	4 9 5
11,839	Reuter's	8	5 %	5 %	5 %	5 %	7⅜— 8	7⅜— 8	7 13/16	7 7/16	+ ½	5 0 0
145,955	Telephone Co. of Egypt, 4½ % Deb. Red.	100	4½%	4½%	4½%	4½%	99 —101	99 —101	..	..	..	4 9 1
3,042	Submarine Cables Trust..	Cert.	6 %	6 %	6 %	6 %	133 —136	130—133 xd	..	..	..	4 10 3
120,000	United River Plate Telephone	5	8 %	8 %	8 %	8 %	7⅜— 7⅝	7⅜— 7⅝	7 11/16	7 7/16	..	5 8 6
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	5⅜— 5⅝	5⅜— 5⅝	5 11/16	..	..	4 7 11
30,008	W. Coast of America, 1 to 30,000 & 53,001 to 53,008	2½	2½%	2½%	2½%	2½%	1⅜— 1⅝	1⅜— 1⅝	..	..	..	4 12 8
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	98 —100	98 —100	..	..	..	4 0 0
207,930	Western Telegraph, Ltd., Nos. 1 to 207,930 ..	10	7 %	7 %	7 %	7 %	13⅜— 14⅛	13⅜— 14⅛	14	13⅞	..	4 18 3
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	100—102	100—102	..	..	..	3 18 5
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	1 3/32 — 1 5/32	1 3/32 — 1 5/32	23/9	21/9	..	Nil
34,563	Do. do. 6 % Cum. 1st Pref.	10	8 %	6 %	6 %	6 %	9¼— 10¼	9¼— 10¼	..	..	..	5 17 1
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	£2 6	15 %	14⅜%	9⅝— 10	9⅝— 10	..	..	..	6 0 0
80,000‡	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	101½—103½	101½—103½	..	..	..	4 16 7

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

640,000	Anglo-Argentine Trams, 5% Cum. 1st Pref. 1 to 640,000	5	..	..	..	5 %	4⅜— 5	4⅜— 5	99/4½	96/3	..	5 0 0
500,000	Do. 5 % 2nd Pref., 800,000 to 1,300,000	5	..	..	..	5 %	4 7/16 — 4 13/16	4⅜— 4⅝	93/9	92/6	+ 1/16	5 5 3
4,465,674	Do. 4 % Deb. Stock	Stock	..	..	4 %	4 %	92 — 93½	92 — 93½	93	92⅜	..	4 5 7
332,387	Auckland E. Trams, 5 % 1st Mort Deb. Stock ..	100	5 %	5 %	5 %	5 %	103 —105	103 —105	..	..	..	4 15 8
830,000	Babcock & Wilcox, 1 to 830,000	1	20 %	20 %	20 %	24 %	5⅛— 5⅜	5 5/16 — 5 7/16	5 13/32	5⅜	+ 1/16	4 7 0
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	100	6 %	6 %	6 %	6 %	1⅜— 1½	1⅜— 1½	..	..	..	4 0 0
1,000,000	British Aluminium 5 % Mort. Debs. Red.	100	..	..	..	..	..	..	..	..	..	5 9 7
500,000	British Columbia E. Rail Def. Ord. Stock	100	6 %	8 %	8 %	8 %	137 —141	137 —141	..	..	..	5 13 6
400,000	Do. Pref. Ord. Stock	100	5 %	5 %	6 %	6 %	118 —122	117 —121	..	..	—1	4 19 2
400,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	108 —111	108 —111	110½	..	..	4 10 1
233,000	Do. 4½ % 1st Mort. Deb., 1 to 6,250	40	4½%	4½%	4½%	4½%	102 —104	100 —102 xd	..	..	..	4 8 3
212,500	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
133,301	British Electric Traction	10	Nil	Nil	Nil	Nil	⅜— 1	⅜— 1	16/6	..	..	Nil
161,437	Do. do. 6 % Cum. Pref.	10	6 %	8 %	14%	Nil	2⅜— 3½	3 — 3⅜	66/10½	62/6	+ 3/16	Nil
1,473,653	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	88 — 92	88 — 92	..	..	..	5 8 8
528,936	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	70 — 75	70 — 75	..	..	..	6 0 0
100,000	British Insulated and Helsby Cables	5	10 %	10 %	10 %	10 %	6¾— 7¼	6¾— 7¼	..	..	..	6 17 11
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	6 — 6½	6 — 6⅜	..	..	..	4 12 4
500,000	Do. do. 4½ % 1st Mort. Deb. Red...	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
201,579‡	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	98 —101	98 —101	..	..	..	4 9 1
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 75,000	5	Nil	Nil	Nil	Nil	5/16 — 7/16	5/16 — 7/16	..	..	..	Nil
1,316,253	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	4 %	61½ — 63½	61½ — 63½	..	..	..	6 6 0
50,000	‡Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	Nil	7/16 — 11/16	7/16 — 11/16	..	..	..	Nil
50,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	Nil	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
140,976	Brush Electrical Engineering, Ord., 1 to 105,731 ..	2	Nil	Nil	Nil	Nil	0 — ⅜	0 — ⅜	..	..	..	Nil
200,000	Do. do. Non-cum. 6 % Pref... ..	2	Nil	Nil	Nil	Nil	0 — ⅜	0 — ⅜	..	..	..	Nil
125,000‡	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	37 — 42	37 — 42	..	..	..	10 14 4
125,000‡	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	4½%	22 — 26	23 — 27	..	..	+1	18 19 3
137,610	Calcutta Trams, 1 to 137,610	5	8 %	6 %	4½%	4½%	4⅜— 5⅛	4⅜— 5 xd	98/9	92/6	..	4 10 0
45,304	Do. 5 % Cum. Pref., Nos. 1 to 29,330..	5	5 %	5 %	5 %	5 %	4⅜— 5⅛	4⅜— 5⅛	..	..	..	4 17 7
350,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	97 —100	97 —100	..	..	..	4 10 0
85,000	Callender's Cable Construction shares	5	15 %	15 %	15 %	10 %	9¼— 9⅝	9¼— 9⅝	9⅝	..	..	5 2 7
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	4 15/16 — 5 1/16	4 15/16 — 5 1/16	5⅛	5 1/16	..	4 5 9
300,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	103¾—105¼	103¾—105¼	..	..	..	4 5 4
491,222	Cape E. Trams., 1 to 491,222	1	Nil	Nil	Nil	Nil	7/16 — 9/16	7/16 — 9/16	7/6	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	8 %	12 %	12½%	12½%	2¾— 3 1/16	3 1/16 — 3 1/16	61/9	60/-	+ 3/16	3 19 4
210,153	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4 %	4½%	105 —108	105 —108	107⅜	107	..	4 3 4
1,890,690	Central London Railway, Ord. Stock	Stock	4 %	3 %	3½%	3 %	63 — 65	62 — 64	64	63	—1	4 13 9
554,655	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	84 — 86	84 — 86	84	..	..	4 13 0
554,655	Do. do. Def. do.	Stock	4 %	2 %	2½%	2 %	44 — 46	44 — 46	45½	44	..	4 7 0
1,480,000	City and South London Railway	Stock	2½%	2½%	1½%	1½%	27⅛— 28¼	27⅛— 28¼	..	..	..	6 2 10
85,000	Crompton & Co., Nos. 1 to 85,000	8	5 %	5 %	Nil	Nil	¼— ⅜	¼— ⅜	..	..	..	Nil
100,000‡	Do. 5 % 1st Mort. Reg. Debs., 900 of £100, and 901 11,000 of £50 Red	..	5 %	5 %	5 %	5 %	83 — 86	83 — 86	..	..	..	5 17 8

* Unless otherwise stated, all shares are fully paid. ‡ From Manchester Share List.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued.*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years.				Closing Quotations Oct. 11th.	Closing Quotations Oct. 18th.	Business done week ended Oct. 18th, 1910.		Rise + or Fall —	Present Yield per cent.
			1906.	1907.	1908.	1909.			Highest	Lowest		£ s. d.
260,000	Dick, Kerr & Co., 1 to 260,000	*	10 %	10 %	6 %	5 %	7/8 — 1	31/32 — 1 1/32 xd	..	..	..	5 3 11
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	6 %	1 1/16 — 1 1/8	1 — 1 xd	18/-	..	..	6 0 0
271,080	Do. do. 4½ % Deb. Stock	100	4½ %	4½ %	4½ %	4½ %	98 —101	98 —101	..	..	..	4 9 1
60,000	Dublin United Trams. (1896), 6 % Pref., 1 to 60,000	10	6 %	6 %	6 %	6 %	12½ — 13½	12½ — 13½	..	..	..	4 8 11
99,261	Edison & Swan Utd., "A" shs., £3 pd., 1 to 99,261	5	4½ %	2½ %	Nil	Nil	1/16 — 3/16	0 — 1/8	..	..	— 1/16	Nil
17,189	Do. "A" shares, 01—017,189	5	4½ %	2½ %	Nil	Nil	1 — 1½	1 — 1½	..	..	..	Nil
307,895	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	63 — 68	63 — 68	..	..	..	5 17 8
67,720	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	5 %	77 — 80	77 — 80	..	..	..	6 5 0
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	Nil	1/16 — 1/8	1/16 — 1/8	7/6	7/3	..	Nil
31,390	Do. do. 7 % Cum. Pref., 1 to 31,390	2	7 %	7 %	7 %	7 %	1 1/16 — 1 1/8	1 1/16 — 1 1/8	..	..	..	10 1 3
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	5 %	7 3/8 — 8	7 3/8 — 8	..	..	..	6 5 0
200,000	Do. do. 4 % Mort. Deb.	Stock	4 %	4 %	4 %	4 %	80 — 84	80 — 84	..	..	..	4 15 8
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	Nil	Nil	3/4 — 1	3/4 — 1	..	..	..	Nil
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	7 %	10¼ — 10⅜	10¼ — 10⅜	..	..	..	6 10 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 —103⅛	102 —103⅛	..	..	..	4 16 10
40,000	Henley's (W.T.), Telegraph Works, Ord.	5	15 %	15 %	15 %	15 %	12½ — 12⅝	12½ — 12⅝	..	..	..	5 17 8
40,000	Do. do. 4½ % Pref.	5	4½ %	4½ %	4½ %	4½ %	5 1/16 — 5 1/8	5 1/16 — 5 1/8	..	..	..	5 4 8
150,000	Do. do. 4½ % Mort. Deb Stock	Stock	4½ %	4½ %	4½ %	4½ %	107⅛ —109½	107⅛ —109½	..	..	..	4 2 2
50,000	India-Rubber, Gutta-percha & Telegraph Works	10	10 %	10 %	10 %	10 %	14⅜ — 15½	14⅜ — 15½	15 3/8	..	..	6 12 3
37,500	†Liverpool Overhead Railway, Ord.	10	Nil	½ %	Nil	Nil	1/8 — 1/4	1/8 — 1/4	..	..	..	Nil
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	5 1/2 — 6 1/4	5 1/2 — 6 1/4	..	..	..	8 0 0
600,070	London United Trams. (1901) 1 to 50,007	10	3 %	3 %	Nil	..	1½ — 2⅛	1¼ — 2⅛	..	..	..	Nil
399,930	Do. do. 60,008 to 100,000	10	3 %	3 %	Nil	..	1½ — 2⅛	1½ — 2⅛	..	..	..	Nil
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	3¾ %	..	1½ — 2⅛	1½ — 2⅛	..	..	..	15 0 0
1,649,930	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	66 — 70	66 — 71	..	..	+1	5 5 8
5,732,062	Metropolitan Consolidated	100	1 %	½ %	¾ %	1 %	38½ — 39	39¼ — 40	40	38½	+1	2 10 0
2,640,914	Do. Surplus Lands	100	2¾ %	2¾ %	2¾ %	2¾ %	66 — 68	66 —68	67	66½	..	4 0 11
8,235,000	Do. District	100	Nil	Nil	Nil	Nil	21½ — 22	23 —23½	23⅜	23	+1⅛	Nil
391,337	Metropolitan Electric Trams., Ord.	1	..	..	4¾ %	5%	3/8 — 7/16	3/8 — 7/16	15/6	..	..	5 14 3
314,016	Do. do. Defd.	1	Nil	Nil	Nil	..	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	3/32 — 5/32	3/32 — 5/32	16/-	..	..	5 9 7
595,600	Do. do. 4½ % Deb. Stock Red.	100	4½ %	4½ %	4½ %	4½ %	96 — 99	96 — 99	..	..	..	4 10 11
$10,823,200	Mexico Trams Co., Common Stock	..	..	..	..	6 %	129 —131	128—130	129½	128¾	—1	4 12 4
$9,000,000	Do. 1st Mort. 50-year 5 % Gld. Bds.	..	..	..	5 %	5 %	97½ — 98½	98 — 99	98⅝	98	+ ⅛	5 1 0
245,500	Potteries Electric Traction	1	4 %	4 %	Nil	..	3/8 — 7/16	3/8 — 7/16	..	..	..	..
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	1/16 — 1/8	1/16 — 1/8	..	..	..	7 5 5
245,000	Do. 4½ % Deb. Stock	100	4½ %	4½ %	4½ %	4½ %	82 — 85	82 — 85	..	..	..	5 3 6
37,350	Telegraph Construction and Maintenance	12	15 %	17½ %	15 %	17½ %	35½ — 37½	35½ — 37½	37	36½	..	5 12 0
140,000	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	101 — 103	101 —103	..	..	..	3 17 8
1,000,000	Underground Electric Railway, 5 % Prior Lien	..	..	..	5 %	..	102½ —103½	102⅝ —103½	103½	102⅝	..	4 16 7
2,800,000	Do. do. 4½ % Bonds	..	..	..	4½ %	4½ %	92 — 94	92 — 94	93¾	93	..	4 14 9
4,900,000	Do. do. 6 % Income Bonds	..	..	..	..	..	37 — 39	37 — 39	37½	..	..	..
66,666	Willans & Robinson, 1 to 30,000 & 80,001 to 116,666	1	Nil	10 %	5 %	Nil	3/8 — 7/16	3/8 — 7/16	..	..	..	..
66,666	Do. 6 % C.P., 30,001 to 80,000 & 125,001 to 141,666	5	..	6 %	6 %	3 %	1 — 1½	1 — 1½	..	..	..	10 0 0
245,495	Do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	60 — 70	60 — 70	..	..	..	5 14 4

ELECTRICITY SUPPLY COMPANIES.

30,449	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10%	10 %	10 %	10 %	6⅞ — 7⅛	6⅞ — 7⅛	7⅛	..	..	6 15 7
9,551	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	6¾ — 7⅛	6¾ — 7⅛	..	..	..	4 14 11
400,000	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	100 —103	100 —103	..	..	..	3 17 8
80,000	Charing Cross and Strand Electricity Supply	5	5 %	5 %	5 %	5 %	8⅜ — 8¾	8¼ — 8⅜	70/-	68/9	— ⅛	6 13 4
80,000	Do. do. 4½ % Cum. Pref.	5	4½ %	4½ %	4½ %	4½ %	4¼ — 4⅜	4⅛ — 4⅜	..	..	..	4 17 4
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½ %	4½ %	4½ %	4½ %	3⅝ — 4⅛	3⅝ — 4⅛	..	..	..	4 17 0
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	97 — 99	97 — 99	..	..	..	4 2 6
49,436	Chelsea Electricity Supply, Ord.	5	4½ %	4½ %	4½ %	4½ %	3½ — 4	3¾ — 4	..	..	..	5 12 6
175,000	Do. do. 4½ % Deb. Stock Red.	Stock	4½ %	4½ %	4½ %	4½ %	99 —101	99 —101	..	..	..	4 9 1
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	7 %	11¼ — 11⅝	11⅛ — 11⅜	11 7/8	11¼	+ ⅛	5 19 2
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	11½ — 12¼	11⅝ — 12¼	11⅞	11	..	4 19 0
400,000	Do. 5 % Db. Stk.	Stock	5 %	5 %	5 %	5 %	120 —124	120 —124	..	..	..	4 0 8
800,000	Do. 4½ % 2nd. Db. Stk.	100	4½ %	4½ %	4½ %	4½ %	99½ —102½	99⅝ —102½	..	..	..	4 7 10
50,000	County of Durham Electrical Power, Ord.	5	4 %	2 %	Nil	Nil	1½ — 2	1½ — 2	..	..	..	Nil
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	5 %	2⅝ — 3¼	2⅝ — 3¼	..	..	..	7 16 10
250,000	Do. do. do. 5 % 1st Mtg. Deb.	Stock	..	..	5 %	5 %	94½ — 96½	94½ — 96½	94½	..	..	5 3 8
40,000	County of London Electric Lighting, Ord. 1—40,000	10	5 %	5 %	5 %	5 %	7⅜ — 7¾	7⅜ — 7¾	7⅝	..	..	6 7 0
55,000	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10⅝ — 11¼	10⅝ — 11¼	11⅛	11 1/16	..	5 6 8
400,000	Do. do. 4½ % Deb. Stock	Stock	4½ %	4½ %	4½ %	4½ %	104½ —107½	104½ —107½	105½	..	..	4 3 9
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½ %	4½ %	4½ %	4½ %	100 —103	100 —103	..	..	..	4 7 5
80,000	Edmundson's Electric Corporation, Ord. Shares	5	Nil	Nil	Nil	Nil	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	3 %	Nil	Nil	Nil	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
430,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½ %	4½ %	4½ %	4½ %	75 — 78	75 — 78	..	..	..	5 15 5
$8,150,000	Electrical Dev. Co. of Ontario, 5% 1st Mtg. Gold Bnds.	$500	..	..	5 %	5 %	82½ — 85½	82½ — 85½	84	..	..	5 17 0
10,000	Folkestone, 1 to 10,000	5	5¼ %	5¼ %	5¼ %	5¼ %	4 — 4⅛	4 — 4⅛	..	..	..	5 12 10
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	5 %	5 %	5 %	5 %	4 — 5⅛	4 — 5⅛	..	..	..	4 11 11
90,000	Do. 4½ % 1st Deb. Stock	100	4½ %	4½ %	4½ %	4½ %	99 —102	99 —102	99⅛	99	..	4 8 3
15,000	Hove, 1 to 15,000	5	9 %	8½ %	8½ %	8½ %	7 — 7⅛	6⅞ — 7⅛ xd	..	..	..	5 19 4
$1,376,000	Kaministiquia Power Co., 5 % Gold Bnds.	100	..	..	5 %	5 %	100½ —102½	100½ —102½	..	..	..	4 17 7
21,000	Kensington and Knightsbridge Electric Ord.	5	10 %	10 %	8 %	8 %	6¾ — 7¼	6¾ — 7¼	..	..	..	5 10 4
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	93 — 95	93 — 95	..	..	..	4 4 3
11,000	London Electric Supply Corporation, Limited, Ord.	3	4 %	2½ %	3 %	..	1⅜ — 1⅞	1⅜ — 1⅞	..	..	..	4 16 0
70,000	Do. do. do. 6 % Pref.	5	6 %	6 %	6 %	6 %	4⅝ — 5⅛	4⅝ — 5⅛	100/-	99/4½	..	5 17 1
362,355	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4¼ %	4½ %	4 %	4 %	90 — 92	90 — 92	93	..	..	4 7 7
200,000	Metropolitan Electric Supply, 1 to 100,000	5	8 %	6½ %	5 %	5 %	3⅛ — 3⅜	3⅛ — 3⅜	75/-	..	..	7 8 2
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½ %	4½ %	4½ %	4½ %	4⅜ — 4⅝	4⅜ — 4⅝	87/6	86/3	..	4 17 4
285,000	Do. 4½ % 1st Mort. Deben. Stock	Stock	4½ %	4½ %	4½ %	4½ %	102 —105	102 —105	..	..	..	4 5 9
248,000	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½ %	3½ %	3½ %	3½ %	82 — 85	82 — 85	..	..	..	4 2 4
$6,000,000	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds	100	5 %	5 %	5 %	5 %	89 — 90	89 — 90½	90⅜	89⅞	+ ⅛	5 10 6
13,585,000	Do. Light and Power Co., Ltd., Common	$100	..	4 %	3½ %	4 %	88½ — 89½	89 — 90 xd	89½	89½	..	4 8 11
$2,400,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	..	7 %	7 %	108½ —109½	105 —106 xd	106	105½	..	6 12 1
12,000,000	Do. do. 5% 1st Mtg. Gold Bnds.	100	..	..	5 %	5 %	93½ — 94½	94 — 95	94⅜	94	+ ⅛	5 5 6
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½ %	4½ %	4½ %	4½ %	96 — 98	96 — 98	..	..	..	4 11 10
130,491	Newcastle-on-Tyne, 1 to 137,500	5	8 %	8 %	2½ %	..	3⅞ — 4⅛	3⅝ — 4⅛	..	..	..	2 17 8
137,500	Do. 5 % Pref., 1 to 137,500	5	5 %	5 %	5 %	5 %	4⅜ — 4⅝	4⅜ — 4⅝	..	..	..	5 2 7
150,000	North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,500	100	..	..	..	5 %	100 —102	97½ — 99½ xd	..	..	..	5 0 6
10,852	Notting Hill Electric Lighting	10	7½ %	7½ %	7 %	..	12 — 13	12 — 13	..	..	..	5 7 8
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	7 %	6½ — 6⅝	6½ — 6⅝	..	..	..	5 3 8
119,694	River Plate Electy. Co. Ord.	Stock	2½ %	6 %	8 %	9 %	210—225	220 —230	223	220	+7½	3 13 3
100,000	Do. do. 6% Non Cum. Pref.	Stock	6 %	6 %	6 %	6 %	100—110	100 —110	..	..	..	5 9 1
200,000	Do. do. 5% Deb. Stk. Red.	100	5 %	5 %	5 %	5 %	100½ —102½	100½ —102½	..	..	..	4 17 7
40,000	St. James' and Pall Mall Electric Light, Ord.	5	10 %	10 %	10 %	10 %	7⅜ — 8¼	7⅜ — 8¼	..	..	..	6 1 3
20,000	Do. do. 7 % Pref. 20,081 to 40,080	5	7 %	7 %	7 %	7 %	6½ — 7¼	6½ — 7¼	..	..	..	4 16 7
150,000	Do. do. 3½ % Deb. Stock Red.	100	3½ %	3½ %	3½ %	3½ %	84 — 86	84 — 86	..	..	..	4 1 5
12,000	Smithfield Markets Electric Supply, Ord.	5	Nil	Nil	Nil	..	1⅝ — 2	1⅝ — 2	..	..	..	Nil
65,000	South London Electric Supply, Ord.	4	3 %	4 %	5 %	5 %	2⅝ — 3	2⅝ — 3	57/6	..	..	6 13 4
130,100	Do. do. 5 % 1st Mort. Deb.	100	..	..	5 %	5 %	99 —102	99 —102	..	..	..	4 18 0
120,000	South Met. Elec. Lt. & Power, Ord.	1	2½ %	2½ %	2½ %	..	3/32 — 5/32	3/32 — 5/32	..	..	..	Nil
142,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1 1/32 — 1 3/32	1 1/32 — 1 3/32	2 1/16	..	..	6 16 7
224,520	Do. do. 4½ % 1st Deb. Stk.	100	4½ %	4½ %	4½ %	4½ %	96 — 99	96 — 99	97½	..	..	4 10 11
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	..	¾ — 1	¾ — 1	..	..	..	20 0 0
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	2 — 2¼	2 — 2¼	..	..	..	10 0 0
275,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½ %	4½ %	4½ %	4½ %	77 — 79	77 — 79	..	..	..	5 13 11
808,000	Victoria Falls Power Co., Pref. Nos. 1 to 808,000	1	..	..	5 %	..	3/32 — 5/32	3/32 — 5/32	..	..	..	5 14 3
100,000	Westminster Electric Supply, Ord.	5	12 %	10 %	10 %	10 %	8 — 8½	8 — 8½	8	..	..	5 11 1
279	Do. do. 4½ % Cum. Pref. (Reduced from 5% since 31st Dec., 1905)	5	4½ %	4½ %	4½ %	4½ %	5 — 5⅛	5 — 5⅛	5½	..	..	4 1 10

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange.

Bank rate of Discount 4 per cent. September 29th, 1910.

THE INEXACTITUDES OF OIL TESTING.

By WILFRED YORKE, A.M.I.E.E.

Probably of all the products of nature there are none so perennially interesting to the engineer as coal and lubricating oil, since they are both from the character of their uses intimately connected with the attainment of the highest efficiency, attributing to the latter word its broadest meaning. Yet the purchasing of these commodities has been, and in a vast number of cases is even yet, accompanied by barefaced inconsistencies.

Coal, on the one hand, was bought simply as—coal, though latterly the more enlightened of our engineers look upon it in its true light as a combustible, buying on a heat basis, and rightly making a reduction for inert matter in the form of ash or water content.

In contradistinction to this, the purchase of oil is usually effected by some form of specification, bristling may be, with a multiplicity of physical or chemical tests so peculiarly applicable to lubricants, which are usually of no value and betray absolute ignorance of the elements of oil refining. The danger lies in the fact that these tests are so simple that the veriest tyro of a student can manipulate them; this, coupled with the direct application of the results by the non-scientific mind, leads to the selection of an unsuitable oil, to the detriment, if not ruin, of the machinery. Further, these tests simply serve to characterise the oil under conditions which do not pertain in practice, and in the majority of cases have not the slightest bearing on the qualities of the oil as a lubricating agent.

The writer holds that the latter is the only fundamental standard (other things being equal) by which to judge any oil, and it is in line with the purchase of coal as an evaporating agent.

Mineral oil is a natural product, and as such is liable to vary in its composition from time to time, even from the same well. Hence the imposition of a binding set of physical or chemical tests is as ridiculous as to expect a certain fixed percentage of carbon, oxygen, &c., in a coal, even from one seam. By stringent adherence to his oil specification the engineer may hoist his own petard, since the oil will probably be doctored to comply with the tests required, thereby deteriorating what might otherwise be a good lubricant.

In pointing out some of the fallacies of these tests, the writer hopes they will be shorn of much of the importance hitherto given them, and relegated to a very minor position when the choice of a lubricant is in question.

The tests to which an oil lends itself include density, viscosity, flash point, fire test, guminess, acidity, evaporation, &c., though the chief, and in some cases the only, essential property of an oil, namely, its emulsifying tendency, is left severely alone, and the writer is forced to the conclusion that this is solely due to ignorance.

Density.—The density (or specific gravity) of any substance is simply its relative weight compared to that of water, and though the estimation of this as a measure of the quality of an oil, has now fallen largely into desuetude, it would not be difficult to find engineers even to-day who excuse themselves by asserting that it serves to check the "quality" as the oil is delivered from time to time. Such an aspect is quite erroneous, since (as pointed out above) mineral oil is a natural and not an artificial product, and cannot therefore have immutable properties.

Hence it follows that the insistence on a certain density, which may have been found suitable in some previous consignment, will be met either by blending or doctoring, the results of which are not always happy.

Viscosity.—Viscosity may be termed the measurement of the fluidity of an oil, and is therefore usually regarded, and rightly so, as an important characteristic of a lubricant. But the methods by which this factor is generally estimated are often so gross as to vitiate entirely its value when comparing different oils.

Specifications can still be encountered where the viscosity of a machine oil is stated for some fixed temperature, usually between 58° and 70° F. The absurdity of this is apparent if the temperature at which the oil will subsequently work is borne in mind. It is just possible that the oil selected on account of its higher viscosity at the testing temperature, has a much lower viscosity at the working temperature than the oils rejected.

Hence the importance of measuring the viscosity over a wide range of temperature cannot be too strongly urged, and this is the only true and equitable method of comparing several samples. The resultant curves should be superimposed to indicate their relative values.

Even then very little weight can be attached to such curves, if the oil in its working environment comes into contact with water.

As pointed out by J. E. Southcombe (Electrical Review, Vol. 66, p. 235) all mineral oils tend to emulsify, and hence a lubricant (selected from the standpoint of viscosity) because of this tendency to form an emulsion, may be much inferior to a rejected oil, which, though of a lower viscosity, is not so readily miscible.

The reservation which should accompany the acceptance of tests for viscosity is therefore patent.

Whilst on this point, it can safely be said that most errors in lubrication are committed by the use of too thick an oil.

For example, taking the hypothetical case of a turbine bearing where the normal working temperature is 75° F. above the surrounding air, it can at once be assumed that this temperature is solely due to friction.

The machine when starting from cold is being supplied with an oil that is a poor lubricant because of its too high viscosity. In consequence heat is generated, which causes the temperature of the bearing to rise, and thinning the oil at the same time reduces the coefficient of friction. The temperature continues to rise until the oil attains such a viscosity that it can absorb and carry away the heat of the bearing friction as it is generated. In other words, the oil has to be heated to 75° F. above the atmosphere before it has a viscosity suitable for use on this particular bearing.

It seems only reasonable to argue that a similar but thinner oil, having an equal viscosity at a much lower temperature, would be vastly preferable, and would enable the bearing to be run much cooler. The viscosity curves mentioned above would be of assistance in such a case.

In coming to cylinder oils, the measurement of their viscosity affords but little indication of the quality.

The practice of taking the viscosity at 212° F. has now been generally discarded, though it is still to be found in many quarters. Such a figure has neither sense nor reason to support it, for a cylinder oil is never used at this limiting temperature. If viscosity curves (as advised for machine oils) be plotted for a series of cylinder oils between, say, 212° F. and 600° F., it will be found there is very little difference above about 400° F. between the various samples, however much they may differ at 212° F. The absurdity of the latter figure is therefore evident.

In commercial use a cylinder oil becomes something quite different. It is used in the form of a thin film on the walls of an engine cylinder in the presence of steam at a high pressure and temperature, and probably superheat. The movement of the piston over such a large area is an ideal one for thoroughly mixing the oil with the water of condensation. All oils emulsify, some hold quite a lot of water, while others will form a complete emulsion.

The oil, therefore, in its working province, is something totally different as regards its physical properties to the virgin oil, and to place any weight on the viscosity tests made on a cylinder oil before being put into use is manifestly bad practice.

Evaporation.—One often hears when the behaviour of a cylinder oil is being discussed, in conjunction with some of the oil residue taken from the engine cylinder as the subject of the *post mortem*, that the oil is "carbonised" or burnt.

Such a conclusion is quite mistaken, for although the working temperature may be high, it is usually accompanied by a high pressure. Under this pressure the oil would have to assume an excessive temperature before burning, and it can therefore be said that very little loss by evaporation occurs during the working period.

When, however, the engine is shut down, the pressure will be removed and evaporation of the hot oil will take place. (The same thing can be noticed on an engine where, due to

a leaking stuffing box, the escaping steam will carry globules of hot oil with it into the surrounding atmosphere, the sudden reduction of pressure vaporising the oil.)

A succession of such periods of rest will eventually produce a deposit in certain portions of the cylinder, but no deduction as to the quality of the oil can be made from the nature of this deposit. The impurities suspended in the steam will have a much greater bearing on its formation than those embodied in the oil—and in cases where this residue has an objectionable appearance (*i.e.*, "carbonised," gritty, or sticky), it will invariably be found that providing the oil is of a reasonably good quality, the steam-raising conditions are of an indifferent nature. No amelioration can be expected, however much the quality of the lubricant is improved, until the necessary correction is made in the boiler plant.

It is therefore essential to have some knowledge of the steam (as regards impurities) before adjudicating on such residues.

Oil Testers.—The type of so-called "oil-tester" in general use consists in principle of some form of dynamometer, and though primarily intended, and usually used for comparing the lubricating properties of oils, its real and only value is in research work on frictional experiments.

To test a set of samples of oil intended for use, say on very heavy bearings, in such an appliance, and then to indicate from the figures obtained that a certain oil is the best of the batch, is obviously unfair. The correct and only deduction to make is that the selected oil is the most suitable one *for the oil tester*; it may fail utterly on the bearing for which it is chosen.

Cylinder oils, too, are very often tested in this type of apparatus. The results are, of course, quite artificial, in that they indicate the performance of the oils in the oil tester only, and cannot possibly be looked upon as a guide to the subsequent behaviour of the oils in a steam engine cylinder.

The measurement of the friction-reducing property of any oil should, therefore, be made *in situ* under normal working conditions on the particular bearing or cylinder for which it is intended; or alternatively, in an oil tester which duplicates in every detail the conditions under which the oil will have to eventually work.

Having thus demonstrated some of the more glaring inaccuracies at present existing, the writer would put forward the following series of tests as the more acceptable ones from a purely scientific aspect. The tests suggested are as follows, and the order in which they are placed is an indication of their relative values, viz.:—Purity, emulsifying property, friction-reducing property, viscosity, flash and burning points and evaporation.

Purity.—It is now generally conceded that a mineral lubricating oil stands a better chance of success if used in the pure state rather than blended (or doctored) with alien substances. Though the introduction of such material may greatly improve the "body" of an oil, and enable it to more satisfactorily withstand various physical tests, yet it may, on the other hand, seriously jeopardise the lubricating power of the oil, which is uncontrollable, and is, after all, the chief property to be considered.

Under this heading would be included tests for animal or vegetable oils, gums, tar, oil "thickener" or pulp, together with the estimation of acidity or alkalinity.

Emulsifying Property.—The sad neglect which has hitherto been afforded to this most important attribute is to be much regretted, for many situations are conceivable where it may rank as the determining factor.

It is to be remarked in this connection, that a mineral oil may emulsify readily with water from one district, and yet may show no inclination to mix with water from another area. It is important, therefore, when investigating this tendency, that the treating water be taken from the actual situation. This naturally implies the use of the condensed steam from the particular engine or plant when trying cylinder oils.

The good results achieved with an oil in one plant are therefore not necessary applicable to another and similar plant, unless the characteristics of the water in each are related.

When the comparison of various cylinder oils is under discussion, the emulsifying tendency should be regarded as the most significant, for the conditions under which these oils work are such as to completely satisfy any miscible tendency.

The chief drawback to an emulsified cylinder oil are—

(*a*) The lubricating power is much reduced, and a greater quantity of oil is required.

(*b*) The emulsion is more easily washed from the cylinder walls, which also increases the consumption.

(*c*) The pollution of the condensed steam when, owing to the very intimate connection between the oil and the water, its use for boiler feed purposes is undesirable unless a costly purifying plant is employed to destroy the emulsion.

J. E. Southcombe, in the article referred to previously, states there is a definite relationship between the emulsifying property of the oil and the interfacial tension of the oil to water. Though the promised amplification of this statement has not yet appeared, it is logical to expect that an investigation of the relative surface tension of an oil to water is the readiest, and at the same time most delicate, test to make when arriving at the emulsifying nature, and the results would be strictly comparable from a scientific standpoint.

Friction-reducing Property.—The investigation of this should be made on the actual machine or engine for which the oil is being intended, and the results obtained applied only to this machine or machines of the same characteristics. If an oil tester is used, it should, as mentioned, be a replica of the situation for which the lubricant is being chosen.

Viscosity.—As stated previously, the determination of viscosity must be made over wide ranges of temperature and the results shown graphically. If the situation is such that the oil has a tendency to emulsify the effect of this must be incorporated.

Flash and Burning Points.—These temperatures are useful, in that they show what margin of safety exists between the highest working temperature, and that of volatilisation.

Evaporation.—The estimation of this factor is of value more particularly in the case of cylinder oils, as it demonstrates the percentage content of the lighter hydrocarbons, which, owing to distillation, is not an effective lubricant.

In conclusion, the writer would reiterate the fact that the lubricating power of an oil is uncontrollable, and the physical properties are subject to manipulation only within wide limits.

If, therefore, the various tests applicable to lubricants be regarded conjointly as so many standpoints of comparison only, and in no degree a method of ascertaining the quality or power of an isolated sample, they assume a certain value, and should assist in the choice of a lubricant for any given purpose.

LIABILITY OF ELECTRICAL CONTRACTORS FOR ACCIDENTS IN MINES.

[FROM A LEGAL CONTRIBUTOR.]

The trouble which is sometimes occasioned by accidents through alleged short-circuiting in mines, not unnaturally leads the mining engineer to consider the legal position. What is the legal liability of the electrical contractor who has installed the plant? If it can be shown that a disaster has happened owing to defective insulation, can the blame be attached to those who put in the plant?

In the matter of laying cables, and, indeed, upon the question whether electricity should be used at all, those who work a coal mine should always be guided by persons who have expert knowledge. Given all the conditions as to danger of short-circuiting being brought about owing to cables being worn and frayed by the traffic and work of the mine, it is for the electrical engineer who has charge of the

job to see that risk is reduced to a minimum. At the same time it is clear that, having regard to the great risk of breakages below ground, no firm would guarantee that a short-circuit would be a thing impossible. What we desire to see is where the liability of the electrical contractor ends under the conditions which usually obtain.

Let us examine, in the first place, the Form of Model General Conditions for Electricity Works Contracts which have been approved by the Institution of Electrical Engineers with a view to seeing whether, if those conditions form the basis of the contract, any liability rests with the contractors after the conclusion of the work. Clause 31 of these conditions provides that :—

> The contractor shall properly cover up and protect such of the work as may be liable to sustain injury by exposure. He shall also take every necessary, proper, timely, and useful precaution against accident or injury to the plant, and shall be and remain answerable and liable for all losses, damages or injury which, during the progress of the work, and until it be taken over, may arise or be occasioned by the acts or omissions of the contractor or his servants, but not for any subsequent consequential loss or damage, nor for any breakage or injury, wholly or partially caused by, or arising from, the acts of the purchasers or others, or due to circumstances over which the contractor has no control. . . .

The clause also provides that, until the plant has been taken over, the contractor shall indemnify the purchaser from all claims under the Workmen's Compensation Act, 1906.

It will be seen that howsoever this clause protects the owner until the completion of the works, it affords him no protection after that time. The period of liability is further defined by Clause 45, which relates to "Maintenance." It is there provided that :—

> Until the final certificate shall have been issued, the contractor shall be responsible for any defects that may develop under normal and proper use arising from bad materials, design or workmanship in the works. When called upon, in writing, by the engineer to remedy such defects, the contractor shall do so with due diligence, and unless such defects be remedied by the contractor within a reasonable time, the contractor shall be responsible for all losses and damages sustained by the purchasers through such defects.

Consideration of the two clauses to which we have referred shows that, if the common form of contract be adopted, the liability of the contractor practically comes to an end when he finishes the job ; and even during that period he is not to be liable for the consequences of any accident for which he is not responsible. A fall of roof, for instance, which caused the break of a cable, and a short circuit, would impose no liability upon him. No electrical firm could be induced to sign a contract which made them insurers of the work for all time.

We are unable to quote any cases which deal directly with the liability of electrical contractors who have been bound by clauses similar to those above set forth. Nor has the question of liability been considered in any cases which bear very directly on the point under discussion. This absence of authority is, to a large extent, accounted for by the fact that any disputes which do arise are heard behind closed doors of an arbitration court.

One point, however, is clear, namely, that in employing a firm of electrical engineers to scheme out an installation, the owners or lessees of a mine must necessarily leave something to the judgment of those who are familiar with the peculiarities of electricity : and people cannot be held liable for the consequences of a mere error in judgment. In one case (Fulham Borough Council *v.* National Electric Co., 1906, 70 J.P., 55) a contract for the installation of electric light in a building to be used for the purposes of baths and washhouses provided (*inter alia*) "that the whole of the work is to be carried out in accordance with the existing rules as framed by the Phœnix Fire Office." Rule 5 of these rules provided that : "Where a system of metal tubes is employed, the metal tubes should be earthed, except in those cases where earthing would not be desirable." A system of metal tubes was employed for the work, and in consequence of such tubes not being earthed, a bather received an electric shock which caused his death. The local authority which owned the baths paid damages in respect of the death, and sought an indemnity from the contractors. In the proceedings against the contractors, the arbitrator found that earthing the tubes would not have been desirable so far as risk of fire was concerned, but would in fact have been desirable so far as risk of accident to bathers was concerned. It was held that there had been no breach of contract, and that therefore the wiring contractors were not liable. The lesson taught by this case is that, in drawing up a contract, the first consideration should be the safety of the men working in the mine. Electrical contractors might well be put upon such terms that safety of life and limb would be considered before cheapness of construction.

It remains to consider whether there is any limit to the liability of the mine-owner for the consequences of an explosion which has been caused by a short-circuit. With regard to the pit men themselves, their right to prefer claims under the Workmen's Compensation is absolutely clear. The accident would arise out of, and in the course of, the employment. Again, it might easily be said that the accident was caused by a "defect in the ways, works, machinery or plant," for which the employers would be liable under the Employers' Liability Act. It is to be observed, however, that there is a section in the Workmen's Compensation Act by virtue of which the employer, having paid compensation to the men, might seek an indemnity against the electrical contractor. For instance, if the accident took place in circumstances creating a legal liability in the contractor to pay damages to the miner, the miner's employer might have to pay compensation in the first instance, but the electrical contractor could be made to indemnify him.

Thus, suppose that during the execution of the works, the installation was negligently left in such a condition that when the current was switched on, a short-circuit occurred and a miner was injured, he could claim damages from the electrical contractor. This liability is based upon the well-known case of Hearn *v.* Pender, 11 Q.B.D. 503, where it was laid down that : "Whenever one person is by circumstances placed in such a position with regard to another, that everyone of ordinary sense who did think would at once recognise that if he did not use ordinary care and skill in his own conduct with regard to those circumstance, he would cause danger of injury to the other person, or property of the other, a duty arises to use ordinary care and skill to avoid such danger." Application of this principle will relieve the mine-owner during the time the contractors are executing the work ; but, as we have seen, it would afford no protection after his liability to maintain came to an end.

The conclusion, then, to which one is driven by the consideration of so much of the law of England as is applicable to the facts, is that the electrical contractor is in no sense an insurer. His liability practically ceases when he leaves the job.

REVIEWS.

1. *Theoretische Telegraphie.* By Dr. F. Breisig, Professor und Ober-telegrapheningenieur im Reichs-postamt.
2. *Die Grundlagen der Bautechnik für oberirdische Telegraphenlinien.* By K. Winnig, Telegrapheninspektor, Frankfurt-A.-Main.
3. *Die Stromversorgung der Telegraphen und Fernsprechanstalten.* By G. Knopf, Ober-postinspektor, Berlin.

Brunswick : Friedr. Vieweg & Sohn.

The above books form Vols. VII, VIII and IX of the excellent series of handbooks of technical telegraphy and telephony, which are being published under the editorship of Geh. Postrat Th. Karrass, the eminent Engineer-in-Chief of the German Post Office, who is himself writing a history of telegraphy for the series.

1. *Theoretical Telegraphy.*—Those who have read the able articles by Dr. Breisig on the theory of telegraphic and telephonic transmission, which have appeared in the *Elektrotechnische Zeitschrift* and other periodicals, will welcome a formal treatise from his pen on theoretical telegraphy, and they will not be disappointed in the present work. It is, in our opinion, the best—perhaps we may say the only—book on the higher mathematical theory of telegraphy which has

yet appeared. The greatest mathematicians, from Lord Kelvin downwards, have applied all the resources of analysis to solutions of the "telegraphic equation" and similar problems relating to submarine cables, but it was reserved to Oliver Heaviside to explain the real effects of resistance, capacity, self-induction and leakance in regard to the transmission of signals and of speech through electric circuits. Twenty years ago most practical men looked upon self-induction as an unmitigated evil, to be counteracted and got rid of so far as possible, not only in telegraph but in telephone circuits, and when Heaviside pointed out that its effect was wholly beneficial and of immense importance in telephony, his theories were disbelieved and ridiculed. The K.R. law held the field for a time, and as has been caustically remarked, "The use of this law would have prevented long-distance telephony in England, even had there been any long distances." But now every intelligent engineer recognises the absolute necessity for scientific and mathematical knowledge in dealing with the problems of modern telegraphy and telephony. In fact, it is safe to say that for every man engaged in telegraph work who ten or a dozen years ago possessed a fair knowledge of mathematics, there are now twenty with a competent knowledge of the higher mathematics and of physics. To such men—those of them who read German—Dr. Breisig's book will appeal. His style is admirably clear; he never loses himself in long, unwieldy sentences, and is never obscure.

In order that the telegraph engineer may be able to keep pace with technical advances and form an independent judgment on the various questions which arise, he must have a wide knowledge of the science of electricity, nearly every branch of which has application in telegraphy. There is, therefore, ample room for a book which shall include the fundamental principles of the whole subject, whilst dealing more fully with those questions which are of special importance in technical telegraphy. This need Dr. Breisig supplies in the present work. He starts from Maxwell's field equations for stationary bodies, which when put in their most general form express the fundamental laws of electrodynamics. They then appear as generalisations of Biot and Savart's law, and of the law of induction, which were both discovered by experiment. The generalisation rests on the hypothesis of the existence of a medium, and that displacement currents follow the same laws as currents in conductors. This use of the fundamental equations of the electric field as the basis of subsequent developments has the advantage that the various phenomena may be deduced as particular cases of the general law. It is never necessary to adopt new hypotheses which involve extensions of the previous ones, but rather to introduce limitations, and no further proof of the truth of the fundamental law is rendered necessary.

It is not possible to give more than a brief outline of the contents of the book. In Part I, after dealing with the electromagnetic field and the quantities which determine it, the author devotes about 20 pages to vectors, explaining the usual operations—addition, subtraction, multiplication, &c.; the geometrical representation of fields by scalars and vectors; the surface integral of a vector; divergence, line integral of a vector; rotation of a vector, &c. A consideration of Maxwell's equations follows. Part II deals with the theory of potential and its applications; electric distribution; the capacity of various conductors and cables; antennæ for wireless telegraphy. Parts III to VI treat respectively of stationary fields, including the inductance of circuits; quasi-stationary fields, including the various combinations of inductance, resistance and capacity; electric oscillations in condenser circuits; sustained electric oscillations, including the theory of the telephone, the disturbance of telegraph and telephone circuits by power circuits, &c.

Part VII deals with subjects which are of the greatest interest at the present time—namely, the propagation through an electric circuit of persistent sine currents or electric waves, and the amount of attenuation and deformation, or distortion, which the waves undergo in transmission; for upon the degree of attenuation and of distortion the distance to which telephonic speech is possible through a given circuit, and the clearness with which it will be heard, depend. The whole subject is very ably dealt with by the author. After giving the fundamental equations—based on the conductor resistance, self-inductance, leakance and capacity of the line per unit of length—and deducing the important wave-length and attenuation constants, he considers the incidence and reflection of waves, and shows graphically by means of spiral diagrams the resultant potential or current (*a*) when both wires of the loop are disconnected at the distant end, (*b*) when connected with an instrument at the distant end. Other subjects dealt with in this part are: Composite lines, their constants, apparent resistances, &c.; electric waves, damping, distortion, significance of distortion in telephony, effective values of resistance, inductance, leakance and capacity at high frequencies, and the measurement of these quantities; "substitution" lines, that is, artificial lines so constructed as to imitate in respect of resistance, inductance and capacity an actual line, and to serve as a standard of comparison for its speaking efficiency (the arrangement described, known as the H arrangement, appears to offer some advantages from a theoretical point of view over the standard cables in use in England and America; but the whole subject of standard cables for telephonic purposes requires, in our opinion, further investigation, as there are not only elements of uncertainty in their construction due to the effect of leakance (which is by no means a negligible quantity), but the use of an arbitrary instead of an absolute standard is an anachronism); the methods of diminishing damping, by "loading," or increasing the self-inductance of the circuit, the theory of continuous loading on the Krarup plan, and of Pupin's method of inserting inductance coils at intervals, are fully given. Part VIII gives the theory of the transmission of telegraphic signals through long cables, and Part IX deals, among other things, with the flow of energy, the dependence of resistance on frequency, the magnetic screening effect of eddy currents, and the electric waves of wireless telegraphy.

The above remarks can give but a very inadequate idea of the scope and contents of the work, which is a valuable contribution to technical literature, and can be confidently recommended to telegraph and telephone engineers.

2. *The Construction of Aerial Telegraph Lines.*—Generally speaking, the usefulness of a German or French text-book dealing with telegraphy is, to an English reader, very limited, owing to the fact that the systems described differ so widely from those adopted in his own country. This objection, however, does not apply to the present work, which is largely devoted to such general principles as are applicable to any system of line construction. Like Dr. Breisig, the author has a clear style, and the diagrams and figures which accompany the text are exceedingly good. The book is divided into four sections. Section I contains an excellent introduction to analytic and graphic statics, with application to roof trusses, frames, &c. Section II is on the strength of materials. Section III deals with materials of construction. The author does not confine himself to the properties of the manufactured article, with which the engineer is, perhaps, most concerned, but describes the metallurgical processes by which iron and steel, copper, zinc and (more briefly) tin, lead and aluminium are produced. The process of galvanising, and the various tests to which metals are subjected, are also described. The various preservative processes for preventing decay in wooden poles by the injection of chloride of mercury (kyanising), copper sulphate (boucherising), chloride of zinc (burnettising), or creosote, are fully described, and other processes which have been proposed are briefly noticed. From the records of the German Administration, extending over a period of 50 years, it appears that the mean useful life of poles treated by the different processes is:—Copper sulphate, 11·7 years; zinc chloride, 11·9 years; mercuric sublimate, 13·7 years; creosote, 20·6 years. With regard to insulating materials the development of forms of insulator is traced, and the manufacture of porcelain and glass insulators described.

In Section IV the mathematical problems to which the calculation of stresses in freely suspended wires and the relations between stress and sag or dip give rise, are very thoroughly gone into, and several worked examples are given which will be of help to the student. Similarly, the strength of wooden and iron poles, simple and compound, and the stresses to which they may be subjected under given conditions, are fully investigated and numerical examples

given. Finally, a design for an iron lattice mast 30 metres high, together with the relative calculations, is given.

The book is, to a great extent, mathematical, and in this respect differs widely from the older treatises on line construction. The author does not hesitate to use the methods of the calculus where necessary. The work should be of great use to the serious student of telegraph engineering.

3. *The Supply of Current for Telegraph and Telephone Installations.*—This work is of a more special character than either of the two preceding ones, and although it contains much valuable information, will not appeal to so wide a circle of readers. Since primary batteries have been to a very large extent replaced by secondary cells for telegraphic and telephonic purposes, the book deals specially with the latter, and with the motor-generators, switching arrangements, safety devices, measuring instruments, &c., used in connection therewith. Primary batteries, although the principal types are described, naturally take a subordinate place.

The methods of calculating the current required for Morse and Hughes circuits in telegraphy and various central battery and local battery systems in telephony are given in Section I. Section II deals with (*a*) primary cells, their first cost, cost of maintenance, &c.; (*b*) Secondary cells, their construction, behaviour in working, capacity, faults, cost, &c.; (*c*) Motor-generators for charging accumulators, ringing machines, Hughes motors, pole changers, and rectifiers. The principal subjects in the remaining section (III) are: (*a*) Switchboards, measuring instruments, switches, and other usual accessories; American plan of working telegraph circuits and telephone systems direct from dynamos; parallel arrangement of primary and secondary batteries; charging accumulators by dynamos, &c.; (*b*) Leads and safety devices. Some general considerations on direct-current generators and motors, and alternating-current generators and motors, are given in an appendix. Like the other books of the series, the present work is well printed, with excellent diagrams and figures, and will be of interest to those specialists who desire to make themselves acquainted with the latest German practice in the use of secondary cells for telegraphic and telephonic purposes.

The Design of Marine Tubular Boilers. By J. D. McKnight and A. W. Brown. London: The Technical Publishing Co., Ltd. Price 3s. 6d. net.

This is quite a valuable book. The object of the authors was quite simple, and they have attained it. They wanted to show the main lines upon which marine tubular boiler design is carried out. There are 15 excellent plates showing details, general arrangement, &c., in the manner of the drawing office. All of the calculations are given. The boiler designed is of the pattern mentioned above—total heating surface 2,270 sq. ft. It will give the student a capital idea of drawing-office work if he takes hold of the book and works out the problem of the design of the boiler step by step, as it is done therein. He should also make the drawings. The same advice may be given to the ambitious draughtsman. One cannot learn drawing-office work by reading, but this book will show one how to carry out the design of a boiler. One must use his note book and drawing board, &c., to obtain full value from the book. The authors have had in mind the design of one type of boiler only, and they have done that so well and thoroughly that it is to be hoped they will show the student how to design locomotive and water-tube boilers also. They know how to present solutions of the ordinary difficulties of design.

Leitfaden zum Elektrotechnischen Praktikum. By Dr. G. Brion. Leipzig: B. G. Teubner. Price M. 10.

This is a useful book of reference for those engaged in electrical testing work, either in the laboratory or the workshop.

It not only describes the methods of carrying out the experiments, but also explains the underlying principles in most cases, and the writer often adds valuable hints obtained from an evidently wide practical experience.

Practically the whole ground of electrical engineering is covered, and, where necessary, further information can be obtained from the useful list of text-books given in connection with each chapter.

The fifteen chapters deal with: General information on measurements and units, usual current sources employed in experimental work, description of the up-to-date electrotechnical laboratory of the Dresden Technical College, electrical instruments, measurements of potential, current and power, resistance measurement, the measurement of inductance and capacity, tests on cells, magnetic measurements, alternating current measurements, tests on D.C. motors and generators, tests on single and polyphase machinery, tests on rotary converters, and photometric tests.

With so much ground to cover, the treatment, naturally, cannot be quite complete, so that here and there the explanations given will hardly satisfy the student, and reference to other books may be necessary, but on the whole the book combines the requirements of a practical laboratory guide and a text-book very skilfully.

EVENING CLASSES.

At the close of the summer of each year, the evening classes of the technical schools are thrown open, and many young men enrol with the hope of acquiring knowledge which will enable them to pass examinations at the end of the session. It is interesting to pay a visit to these schools on the opening nights and to watch those present eagerly studying the prospectus, seeking advice from the teachers, buying books, pencils and paper at the school's bookstall and making other preparations for strenuous work during the forthcoming winter evenings.

Some are new students, who have not attended evening school before, whilst others have returned to acquire fresh and more advanced knowledge, or possibly to go over old ground. It is usually easy to distinguish the old from the new students. The former are to be seen in groups discussing the merits and demerits of the teachers, speaking of the last examinations, and airing their opinions as to the improvements which might be made in the school to which they belong.

One attributes his failure to pass an examination to overtime, necessitating his absence from the class on many occasions, whilst another expresses the opinion that the paper was "stiff," a third condemns the teacher, a fourth openly admits that he neglected his homework, and he who is silent is often guilty of having attended a class for no definite purpose save, perhaps, to play the fool. The old student knows that little work is done in a class on the opening night, so having filled up the entrance forms and paid his fees, he goes home.

But the new student, to whom the evening school is fresh, moves in a totally different atmosphere. He is full of excitement, anxious to see his teachers, to talk with them and to seek advice as to the subjects he should study and the books to procure. The evening school to him has a charm. His books are like new toys, and his drawing board constitutes a bosom companion. He hurries to his first class as soon as possible, takes many notes and is really sorry when the time arrives to go home. He labours hard at his home work, and having finished it longs for the time to arrive when he has to pay another visit to the school. Thus we find that many of the classes during the first part of the session are overcrowded, and the whole of the machinery of the establishment is working at its utmost capacity. In the laboratories business is particularly brisk. Here we find students gathered round the various apparatus and machines and eagerly watching some experiment, jotting down figures in note-books and plotting curves. Occasionally a difficulty will arise, which may be responsible for an argument between two or more members of a group, and in the absence of a definite conclusion, operations are suspended until a demonstrator arrives.

Such is a picture which represents not inaccurately the state of affairs in most of the evening technical schools during the early part of the winter session.

But now let us examine the scene a few months later when the severe weather of the winter has set in, and more difficult work in the classes has been entered upon. The new and enthusiastic student has become less keen, the novelty of evening study has worn off, and he no longer looks forward to his class night, for he has become more interested in other things.

There are naturally exceptions, but the fact of the attendance dropping off in nearly all technical schools after the first few months is sufficient to indicate that a fair proportion of the students lose interest in their work, and as a consequence either put in an appearance irregularly or completely discontinue to attend. A peep into the class rooms towards the close of the winter's session will reveal many tired faces, and an examination of the laboratories will show that the keenness so apparent at the commencement has to a large extent ceased to prevail. Much of the experimental apparatus lies idle, for, as a rule, the attendance has fallen off to a remarkable extent, and many of those students who are in evidence appear tired and weary, and not particularly interested in the work which they have in hand.

There are various causes for the loss of enthusiasm on the part of evening students, some of which are unavoidable, whilst others are due to the teachers and other responsible individuals concerned. First and foremost, there are naturally young men who join these classes who were not born to work, or at all events not in the evenings. Somehow, this class of so-called student acquires the idea that evening classes are organised for the purpose of providing him with opportunities for playing jokes, and it is not until he has attended for some evenings that he finds he is mistaken. Having made this discovery, he ceases to attend, and so puts his teachers to the unnecessary trouble of continually writing to him to learn the cause of his absence. Finally, his name is struck off the registers, and in due course he is forgotten. Happily, however, the number of such students who join the evening classes is not large. As a rule the evening student is a young man who means business. He goes to his classes with the object of learning, although he may become a little sick and tired of it towards the end of the session, and may even fail to attend his classes regularly. Sheer fatigue and inability to stand up to the strain of perpetual day and evening work are often responsible for this, and it is in this connection that the authorities of technical institutions are often to blame.

A perusal of the prospectuses issued by the various technical schools in London alone will reveal the fact that numerous subjects are now taught. Under the headings of electrical and mechanical engineering there are classes on machine drawing, mathematics, mechanics, motor-car work, aeronautics, dynamo design, heat engines, hydraulics, metal turning and fitting, chemistry and various other subjects. Special courses are mapped out for different students involving attendance, in some cases, as many as four or more times a week. In the same evening the student passes from one class to another, and it is surprising how well some endure the burden. But there are others who, whilst enthusiastic and perhaps over ambitious, are unequal to the strain, and they, too, become responsible for poor attendance and give rise to trouble and anxiety on the part of the teaching staff. The tendency of to-day is to expect far too much from the evening student, and as a result he frequently gives up in despair, whereas had his studies been properly directed they would have proved interesting to him and his efforts would have been rewarded by success.

A young man who has little to do in the daytime can take full advantage of all the valuable services which the evening technical schools offer, and the same applies to those who are not so favourably situated if they extend their studies over a long period. An apprentice who is serving his time in the shops and who is expected to be at the works by 6 o'clock in the morning cannot hope to derive much benefit from evening schools if he attempts to attend more than two, or at the outside three times a week, and it is for teachers and others connected with such schools to see that no attempt to do more than this is made.

It is a regrettable fact that students are often induced by the teachers to join more classes than they originally intended. A youth, for example, sets out with the intention of becoming a member of an electrical engineering class. He fills up a form and takes it to the teacher. The latter asks him what he knows about mathematics, and the student replies "Nothing," whereupon he is told that he must join a mathematics class, and this he does. The teacher of the steam class tells him that he must study mechanics, and in this way it often happens that a student is overburdened. Guidance on the part of the teachers is undoubtedly desirable, but it is essential that a careful study should be made of each individual case, and the daily occupation of a student, and the time he has upon his hands, should be taken into account. Much of the trouble in this direction arises from the fact that numerous students join classes on the same evening, when there is no time for the teachers properly to consider such specific cases. Arrangements should be made for the teachers to be present at the schools for several evenings before the classes commence, when students could avail themselves of the opportunity of securing sound and properly thought-out advice. Another method of ensuring that no member of an evening school is attempting too much would be for the Principal or some other responsible person to examine the books after the enrolment night, and to pick out the names of those students who are attending the school on, say more than two or three evenings. These students could be called together and the circumstances under which they were working ascertained.

Perhaps nothing has a greater effect upon a student's progress and the attendances he makes at the school than the methods of teaching adopted by the instructors. There are good teachers and there are bad. That they must be qualified, so far as possessing knowledge relating to their particular subject is concerned, is well understood, but the powers many have of imparting this knowledge to others are often far from great. A good teacher must possess tact, energy and the power of expressing himself clearly. He should be capable of making his lectures interesting, and so to cause the classroom to resemble a place of recreation rather than a dull and dreary den. Just as the actor or writer cultivates a style and strives to entertain, so should the teacher do at the technical school. This may sound a little odd, but those who have attended the excellent lectures of such able men as Prof. S. P. Thompson will understand and appreciate the meaning of the statement.

It is true that some subjects lend themselves more readily to this kind of thing than others, but this is no reason why lecturers should drawl out their words and give the students the impression that they are half asleep. Even the difficult subject of mathematics lends itself to entertainment if a teacher will take the trouble to throw a little life into his work and endeavour, where possible, to apply it to problems of practical interest.

Speaking of mathematics, this is undoubtedly a subject which disheartens students more than any other. The letter appearing in this journal for July 16th over the signature of "Adsum" sets forth not inaccurately the state of affairs concerning mathematics. A very poor percentage of the students who attend these classes pass the examinations, and this is due in a very large measure, as "Adsum" rightly points out, to the enormous amount which the educational authorities call for. Why a student should be expected to show that he is capable of performing multiplication and division by the contracted methods in addition to being conversant with the use of logarithms is not easy to understand. Mathematics masters frequently admit that these contracted methods and so-called short cuts are not only valueless, but have the effect of muddling students with the ordinary methods which they well understand.

There is not the least doubt that the pure and practical mathematics papers which are issued by the Board of Education constitute the most difficult of any set by that body. For a student to get through the so-called second stage examinations in practical mathematics, he must have practised his work hard and continuously for months beforehand, and unless he has the time to do this, it is a physical impossibility for him to pass. The amount of work which a candidate who sits for this examination is expected to get through in three hours is outrageous and absurd in the extreme.

There is one other point in connection with evening classes to which attention may be directed in concluding this article. In the laboratories time is frequently wasted

due to the fact that the students meet with difficulties, and then have to wait until one of the instructors can come to their assistance. Speaking generally, the number of instructors attached to the laboratories is altogether inadequate to meet the demands of the students, and more particularly so at the commencement of the session, when the attendance is good and enthusiasm is in evidence. It is, of course, impossible to employ a large staff of properly-qualified instructors simply to meet the demands of the practical work, but there is no doubt that many advanced students would be happy to assist in this direction, and particularly those who are desirous of becoming teachers.

Evening schools have undoubtedly done great work, but the main fault that now exists is the tendency to do too much, and it is an unfortunate circumstance that so many students are led into error in this direction.

QUERIES ? ? ?

By INTERESTED.

"My Committee is considering the question of wages paid to the works staff, and I have been instructed to ascertain particulars of the wages (or salaries) paid at your station, for the purpose of guiding my Committee in their decision on this subject. I shall, therefore, be obliged if you will kindly favour me with answers to the queries contained on the enclosed form. Assuring you of my willingness to reciprocate at any future time, &c."

This form of cadging letter will immediately be recognised by many readers, who may, perhaps, be inclined to use bad language at seeing this well-known begging epistle in cold type. However, the following remarks are not really intended for such, but are directed more particularly to those who are responsible for the sending of such inquiries.

Why cannot these estimable gentlemen take the advice of their chief officer on these matters, and decide accordingly? Why should they all, or the majority of them, be so willing to advertise their inability to judge for themselves, or so unwilling to take advice from the chief, as to the value of the services of their staff? The letters seem to say, "what are you paying men called so-and-so?" No thought appears to be given to any one man's work; all are bracketed together. If you are called a stoker, then a stoker's pay for you; a clerk—then a clerk's pay for you. No matter if a man really is worth more than the usual scale of pay, he stands but a poor chance of getting on so long as this form of "guidance" is obtained from other stations.

This continual cadging for information is not confined solely to wages and salaries. Far from that. Questions are frequently received dealing with general information, and although not of quite such frequent occurrence, are in themselves objectionable to a certain extent. Once I saw a chief scrawl across a list of these questions, "I use my brains, and act accordingly." Not very polite, perhaps, but to the point. Would that others acted in the same manner sometimes.

These lists of queries, some of them covering as they do more than one foolscap page, have become sickening. They almost speak out and say, "Please inform us how you manage your station." The time is nigh for this form of indiscriminate cadging to cease. Few people object to giving a little friendly advice now and then, but these lists of "How do you do so-and-so over your way?" have become so numerous of late years, and some of the questions so personal, that one wonders where they will end.

Sometimes I wonder what the thoughts of those persons responsible for sending out such letters would be were they to overhear only one-half of the polite (?) remarks passed by the recipients of the missives. A chief writing to a brother engineer asking for certain information is one thing, but the "I have been instructed, &c.," form of epistle is quite another; it is becoming of too frequent occurrence to pass unnoticed much longer.

It would not be a bad idea if all the members of electricity, or electricity and lighting committees, or whatever they are termed, were supplied regularly week by week with a copy of some technical journal such as the Electrical Review, at their own expense, or at the expense of the local populace, to enable them all to keep in touch with modern methods. I really believe the gain would be on the side of the general public in the long run.

Of course, these remarks are made generally, for I am well aware that all councillors are not alike, and there is a certain percentage of them to whom these words do not apply. But the larger percentage, well, as a well-known lamp advertisement card says, "'nuf said."

TRADE STATISTICS OF JAMAICA.

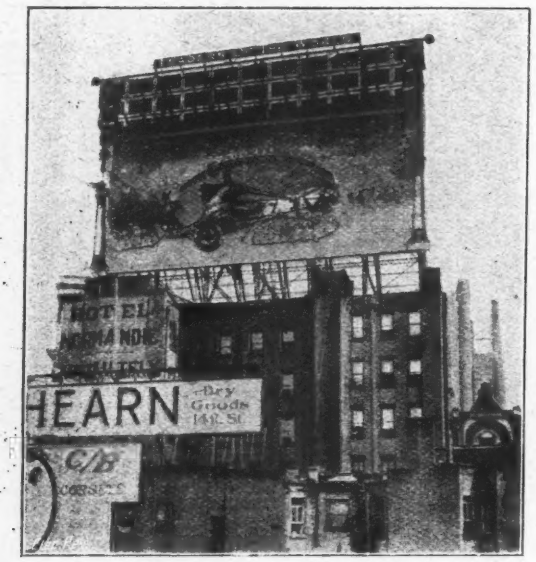
The following figures, showing the imports of electrical and similar goods into Jamaica during the year ended March 31st, 1909, are taken from the official trade statistics recently issued; the figures for the previous year are given for purposes of comparison, and notes of any increases or decreases are added:—

	1907-8.	1908-9.	Increase or decrease.
	£	£	£
Electrical apparatus for lighting, and parts thereof.—			
From United Kingdom ...	4,938	254	— 4,684
„ United States	8,723	8,765	+ 42
„ Germany	885	98	— 787
„ Other countries ...	—	14	+ 14
Total ...	14,546	9,131	— 5,415
Steam engines, other than agricultural.—			
From United Kingdom ...	2,464	5,889	+ 3,425
„ United States	3,280	2,696	— 584
„ Germany	—	164	+ 164
„ Other countries ...	—	255	+ 255
Total ...	5,744	9,004	+ 3,260
Machinery, other than steam engines, and not agricultural.—			
From United Kingdom ...	2,415	1,426	— 989
„ United States	2,390	2,484	+ 94
„ Germany	121	75	— 46
„ Other countries ...	—	44	+ 44
Total ...	4,926	4,029	— 897
Railway rails.—			
From United Kingdom ...	153	5,508	+ 5,355
„ United States	432	1,548	+ 1,116
„ Germany	—	377	+ 377
„ Other countries ...	—	1	+ 1
Total ...	585	7,434	+ 6,849
Telegraph and telephone wires and apparatus.—			
From United Kingdom ...	227	143	— 84
„ United States	341	431	+ 90
Total ...	568	574	+ 6
Earthenware, china-ware and porcelain.—			
From United Kingdom ...	8,219	5,983	— 2,226
„ United States	496	901	+ 405
„ Germany	1,457	1,151	— 306
„ Other countries ...	58	89	+ 31
Total ...	10,230	8,124	— 2,106
Scientific instruments.—			
From United Kingdom ...	1,598	1,621	+ 23
„ United States	631	703	+ 72
„ Other countries ...	38	61	+ 23
Total ...	2,267	2,385	+ 118
Lamps, &c.—			
From United Kingdom ...	1,433	964	— 469
„ United States	2,909	2,694	— 215
„ Germany	71	122	+ 51
„ Other countries ...	—	42	+ 42
Total ...	4,413	3,822	— 591

A BROADWAY ELECTRIC SIGN.

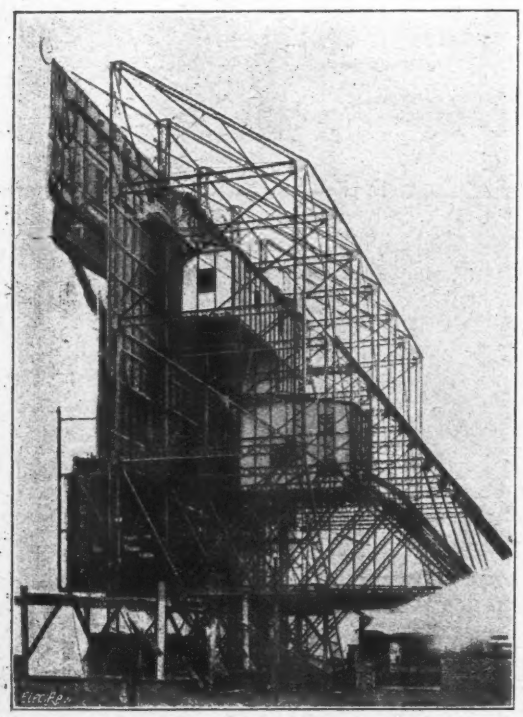
An exceedingly large electric sign containing some 20,000 incandescent lamps was fixed on the roof of the Hotel Normandie, Broadway, New York, a month or two back.

The structure, which stands 72 ft. above the roof, and is 90 ft. long, represents a Roman chariot race in sufficiently enlarged proportions to make the figures clearly visible in the street below. Thus the main chariot driver and horses are 20 ft. high and 40 ft. long, and the chariot wheels 8 ft. in diameter.



Electric Sign in Broadway, New York.

According to the *Electrical World*, in which paper our views appeared, the design of this moving picture is based upon the operation of the lamps in great part. These flash until the walls of the arena appear to be left behind. When the motor-operated switches are thrown in, foremost in the race appears a huge



Sign Superstructure, showing Switch Houses, &c.

pair of horses outlined in flame, galloping madly and drawing the rolling chariot and giant driver on to victory. The arena track apparently moves from beneath the swiftly rolling wheels and plunging horses. Behind the main chariot is another chariot also in motion.

The front of the stadium wall is decorated with festoons of coloured lamps gracefully draped in artistic clusters. The different figures and stagings are all cut out in their exact shape from metal. The chariots, traces, capes, breast collars and harness are painted in red and gold, and studded with ruby and amber lamps. The roadbed of the arena is appropriately painted to represent tracks and dust, and is illuminated with over 1,000 lamps.

With one device the position of the horses' limbs is changed, throwing them smoothly backward and forward with such speed and grace as to cause the horses of fire to appear to be running at a terrific speed. Another device causes the wheels of the main chariot to appear to revolve so swiftly that the spokes cannot be seen. Every little detail, even to the allusion of dust rolling up behind the wheels and from beneath the hoofs of the horses, is carried out. Another device causes the crimson robe of the leading charioteer, as well as his Roman skirt, to flutter behind him, making the race more realistic. The manes and tails of the horses appear to be blowing fiercely in the wind, and while the great chariots and horses appear to be plunging onward, the lamps illuminating the road bed are operated by means of flashers so that the road appears to recede from under the flying hoofs and rolling wheels. The lamps that decorate the centre of the arena walls are also made to move in a direction opposite to that of the chariots which, together with the moving effect of the road bed, adds wonderfully to the general action and completes the illusion, as though the great race were actually passing around the amphitheatre.

At the top of the display, in mid-air, hangs a great steel curtain 90 ft. long and 20 ft. high, outlined with a border of ruby lamps. This curtain is decorated with fringe and heavy cord and tassels carried out in mammoth proportions, and is suspended directly over the main horses so as dominate the entire display. This space is used for advertising, and covers nearly 1,800 sq. ft. On this surface each advertisement is displayed in turn, room being provided for 54 letters and spaces. These rows of 18 letters each are made up as monograms, each of the monograms being 4 ft. high and studded with lamps capable of being read at a great distance. The sign is lighted every night from dusk until midnight, and every 9 or 10 minutes the programme is repeated. About 2,750 switches are operated by means of two 10-H.P. motors, and the flashers are designed to give 2,500 impulses of light per minute.

The lamps are of from 2 to 32 C.P. in the sign, and in the reflectors which illuminate the sky are 100 C.P. tungsten lamps. Some 600 H.P. is stated to be required to operate the sign, which, it will be gathered, upholds America's taste for big things.

THE COST OF ARBITRATION PROCEEDINGS.

[BY A LEGAL CONTRIBUTOR.]

When in a reflective mood, the lawyer sometimes says to himself, "If the client could see the bill of costs beforehand, would he ever enter upon litigation in any form?" Were such power of prevision conferred upon the lay client, the lawyers' vocation would be almost at an end; for one side would in most cases show the white feather.

If the cost of litigation is great in all ordinary commercial cases, it is far more serious in all inquiries which involve much technical detail. Sometimes the layman fondly imagines that he will save money by referring a matter to arbitration instead of going to law, but this is to a large extent a fallacy.

Let us consider, for a few moments, what are the normal and necessary items in the bill of costs which has to be paid by a litigant who is unsuccessful in arbitration proceeds. He has to pay the amount for which the arbitrator says he is liable; the fees of the arbitrator—possibly the fees of two arbitrators and an umpire; the taxed costs of the successful party; and last, but not least, his own costs. The "taxed costs" include (*a*) the cost of preparing copies of a host of documents; (*b*) the fees of expert witnesses—many of whom may be eminent and therefore expensive; (*c*) the fees of counsel and counsel's clerks; and (possibly) (*d*) the cost of preparing a number of plans and models, which in a scientific case are almost indispensable if the mind of the tribunal is to be directed to the vital points in issue. Finally, there may be the costs of an unsuccessful appeal.

Contemplation of these facts may give pause to him who is about to sign a contract which contains an arbitration clause. He may imagine that, in the long run, an appeal to a domestic tribunal will be cheaper than recourse to the ordinary tribunals of the land. But he should not forget that by going to law he, at any rate, saves the fees of the arbitrators!

If a long technical case comes to the courts, it is usually referred to an official referee, before whom the inquiry is conducted in a manner very similar to that which is adopted in the case of an arbitration. But every such case is costly, especially where it involves inquiry lasting for many days.

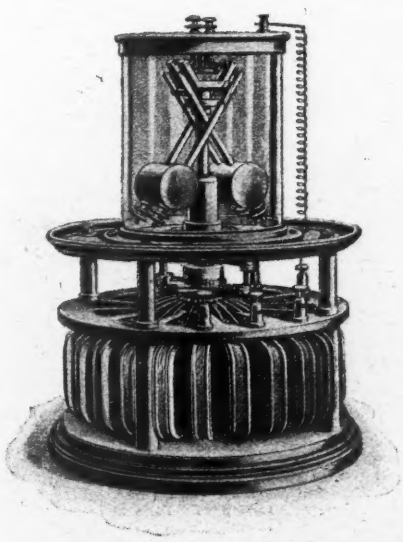
Sometimes it is expensive even for the successful party. The following example (which is better than precept) may serve to "point the moral" for the engineer who is wisely advising his clients to settle a dispute rather than fight it out in court.

A firm of electrical engineers supplied machinery to a local authority and undertook to maintain it for a certain number of years at so much a year. According to the terms of the agreement between the parties, the capacity of the machinery was to be kept up to a specific standard. After the agreement had been in force for some years, there was a falling off in capacity. The local authority alleged that this was due to "failure to maintain" as

per contract; the electrical engineers put the blame on the servants of the local authority, who were responsible for the every-day working of the machinery. The electrical engineers having refused to do anything further, the local authority cast out all the machinery, alleging that it was quite useless, and brought an action for £1,200, being the price of new machinery to take the place of the old, and damages in addition. The defendants denied liability, and the action, being of a technical character, was referred to an Official Referee. Some six weeks before the hearing, the defendants, realising that they were to some extent in the wrong, paid £200 into court with a denial of liability. It should be pointed out, for the benefit of the non-legal reader, that if the defendant pays money into court, the plaintiff may take it out, stop the action there and then, and recover the taxed costs already incurred by him. In the case under notice, the plaintiffs, who thought that £200 was insufficient, did not take it out, but went to trial. The case lasted a fortnight. The Official Referee found that the defendants had broken their contract, but that enough had been paid into court. Consequently the plaintiffs had judgment for the £200, plus the costs down to the date of payment in, but the defendants were awarded the taxed costs of the trial. The figures were somewhat startling! The defendants' taxed costs of the trial came to £800 odd. This sum the plaintiffs had to pay to the defendants. They had also to pay their own costs of the reference, which could not have been much less than another £800. The defendants, however, had to pay all the costs prior to their payment into Court, but as the plaintiffs paid this sum to their own lawyers, they gained nothing by this. The net result of the action, so far as the plaintiffs were concerned, was claim, £1,200; on the credit side, amount recovered, £200; on the debit side, costs of trial, £1,600. It is little consolation, when you make a claim for £1,200, to find that the only result is to incur a liability of £1,400. Many another litigant could tell a similar tale. Even if a claim is entirely successful, there are generally costs to be paid in respect of matters not allowed on taxation. Finally, owing to the intervention of bankruptcy, judgment for debt and costs is not always followed by a successful execution.

THURY'S ELECTRIC CLOCK.

It is well known that clocks controlled by conical pendulums are not so exact in regulation as those having the ordinary swinging pendulums. There are, however, many cases, such as the driving of astronomical equatorials, registering chronometers, seismographs, &c., for which a very uniform and continuous motion is required, combined with a considerable torque, and for these cases the intermittent to-and-fro motion of the ordinary pendulum is not suitable. To meet such cases, an improved electric clock



The Thury Electric Clock.

controlled by a powerful conical pendulum has been devised by R. Thury, and is shown herewith. This is a master clock, from which any number of secondary clocks can be operated in exact synchronism. It consists of a motor-generator with fixed slotted Gramme-ring armature below, and is driven from some outside source, such as an accumulator battery. Inside this armature a soft iron electromagnet is arranged to rotate, and this drives the main vertical clock spindle. This magnet carries two independent windings—one for the main excitation and the other as a regulating excitation.

Two collector rings attached to the spindle serve to carry the current from the battery both to the main magnet exciting winding, and to the stationary armature, through a pair of adjustable revolving brushes rubbing on the stationary commutator of the armature. The double-crossed-arm conical pendulum is attached to the upper part of the vertical spindle, as shown. It is arranged to be isochronous over a considerable angle. The upper parts of the pendulum rods act as an adjustable contact-maker, which serves to make or break the circuit of the auxiliary regulating winding on the magnet. As soon as the pendulum bobs open out beyond a certain angle, the contact is broken, and the current cut off from the auxiliary winding. As this auxiliary winding is arranged to act in opposition to the main winding, this increases the field strength of the motor, and thus slows it down. The heaviness of the bobs prevents any appreciable speed fluctuations occurring between two successive regulations. The current broken at the contacts is kept very small so as to avoid sparking.

Three equidistant tappings are taken out from the stationary armature winding, and these form the generator part of the motor-generator, and serve to provide the polyphase alternating current used to drive the secondary clocks. Three wires, or two wires and an earth connection, join the master clock to the whole of the secondary clocks for this purpose.

The secondary clocks contain merely a simple synchronous motor consisting of two stationary armature coils and a permanent magnet rotating within them in exact synchronism with the supply current. The actual speed of the secondary clocks can be given any desired value by varying the number of poles in the synchronous motor. If two or three-phase currents do not give a sufficiently constant turning moment, it is an easy matter, by means of transformers, to produce a six-phase supply.—*Zeitschrift für Schwachstromtechnik No. 5.*

Temperatures of the Electric Steel Furnace.—In a communication to "Metallurgical and Chemical Engineering," quoted in the *Iron and Coal Trades Review*, Prof. B. Neumann discusses the claims of high temperatures for steel refining in the electric furnace. Temperature measurements made at the Héroult furnace of the Illinois Steel Co., at South Chicago, Ill., U.S.A., were so low as to indicate that the electric steel on the average was not hotter than the steel in a Bessemer converter. He finds the reason for this in the fact that at the South Works Bessemer steel is refined for but one or two hours in the electric furnace, only 200 KW.-hours per ton of steel being supplied, so that the steel is only of good average quality—0·4 C, 0·4 Mn, 0·03 S, and 0·03 P. Prof. Neumann gives details of temperature measurements he made in the case of a Nathusius furnace of 5½ tons capacity at Friedenshütte, in Upper Silesia, which were of about the same range as those noted at South Chicago. His statement and comment are as follows:—

"Converter steel was charged into the electric furnace and refined to a very soft steel containing 0·5 to 0·6 C, and very small amounts of sulphur and phosphorus (0·0003 to 0·02 S, and 0·004 to 0·017 P). The treatment lasted for 3½ to 4½ hours, and the energy consumption per ton of steel was 300 to 400 KW.-hours.

"The converter metal when poured into the smaller ladle had still a temperature of 1,450 to 1,470° C. When poured from the ladle into the electric furnace the temperature was 1,435 to 1,450° C. The interior of the furnace (immediately after the pouring of the finished steel) had a temperature of 1,535 to 1,560° C., the points of the electrodes, when being withdrawn, being at 1,300 to 1,350° C. The temperature of the electric steel when poured was 1,500 to 1,520° C., for a soft charge, and 1,558° C. for a high silicon charge. In the latter case the temperature when pouring into the ingot was still 1,500° C.

"Since the electric furnace had always to wait a certain time for a charge of fresh Bessemer metal, the interior of the furnace cooled to about 1,000° C. After the metal had been charged into the furnace and the reaction was completed, the temperature of the slag layer was measured and was found to be, after 1 hour, 1,550° C., and after 1½ hours, 1,600° to 1,650°. It remained at 1,600° to 1,650° until the slag was removed, when its temperature was found to be between 1,500 and 1,560° C. The removal of this first slag and the introduction of the dephosphorising slag caused the bath to cool off somewhat, and the temperature remained in the second period of the treatment a little less than in the first period. These figures prove that an abnormally high temperature is not necessary for the refining process. As a matter of fact, even the heat of the arc is not absolutely necessary for the local heating of the slag, since it is generally known that the Röchling-Rodenhauser furnace permits the same far-reaching refining reactions to be carried out down to traces of sulphur and phosphorus without any arc. The refining possibilities of the electric steel furnace are, therefore, certainly due to a larger extent to the non-oxidising atmosphere than to a very high temperature. There is no doubt that the possibility of producing a higher temperature in the electric furnace helps the refining process considerably, since the higher basic slag can be easily kept fluid, but, as mentioned above, the arc furnace is not absolutely necessary for this purpose. On the other hand, it is quite self-evident that, at the places right below the electrodes, the temperatures are much higher than the above average temperatures. Calcium carbide, which has often been observed in the arc furnace, begins to form only at about 1,820° C. It does not form in the induction furnace. Further, the electric steel furnace offers the possibility of heating the metallic bath for special purposes to a much higher temperature than is possible in other furnaces."

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

AMENDMENTS.

NETHERLANDS.—According to information received at the Board of Trade through the Foreign Office, proposals for a new Customs tariff are now before the Netherlands Council of State, but they will probably not be made public for a few weeks.

COLUMBIA.—The Board of Trade has received information through the Foreign Office to the effect that the Columbian Minister of Finance has reported to the Assembly that steps are being taken to collect data to serve as a basis for framing a new draft Customs Tariff, with a view to the introduction of a Government Tariff Bill in the session of 1911.

AUSTRALIAN COMMONWEALTH.—The following decisions have recently been given by the Australian Customs authorities :—

Chandeliers, gasoliers or gas pendants, imported with burners, glass globes, silk shades, &c. :	
Globes and chimneys	20 % ad val.
Textile shades	25 % „
Chandeliers, gasoliers or pendants	20 % „
Electrical appliances :	
Accumulator parts and fittings, when imported together, viz., boxes, wood, lead-lined ; disks, lead ; insulators, porcelain ; plates, glass ; plates, spray (glass) ; sheets, glass	free
N.B.—These form a substantially complete accumulator or storage battery.	
Conduit tubing made up of layers of coarse paper, saturated with pitch	10 % ad val.
Telephone switchboard :	
Retardation coils ; repeating coils ; spring jacks ; and resistance spools for telephone switchboards whether imported with board or not	free

NOTE.—The duties quoted above are those leviable on British goods under the Preferential Tariff.

UNITED STATES.—The following decision has been given by the Customs Authorities :—

Steel light shades enamelled with vitreous glass and bell-like in form, dutiable as other similar hollow ware of iron or steel enamelled or glazed with vitreous glasses	40 % ad val.

DENMARK.—The following decision has been given by the Customs Authorities :—

Porcelain insulators with iron bar...	70 krone per kg.

Krone = 1s. 1⅓d. kg. = 2·2 lb.

NEW PATENTS APPLIED FOR, 1910.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

22,841. "Improvements in electric arc lamps." GESELLSCHAFT FUR MASCHINEN-UND METALL INDUSTRIE M.B.H. (Date applied for under Sec. 91 of the Act, October 3rd, 1909, being date of application in Germany.) October 3rd. (Complete.)

22,842. "Improvements in electro-magnetically-operated switches, particularly adapted for controlling electric motors." F. SCHATTNER. October 3rd. (Complete.)

22,859. "Improvements relating to metallic-filament lamps." WESTINGHOUSE METALLFADEN GLUHLAMPENFABRIK G.M.B.H. (Date applied for under Sec. 91 of the Act, October 6th, 1909, being date of application in Austria.) October 3rd. (Complete.)

22,857. "Improved method of and apparatus for distributing oil to a number of lubricating places." Firm R. BOSCH. (Date applied for under Sec. 91 of the Act, November 29th, 1909, being date of application in Germany.) October 3rd. (Complete.)

22,888. "Improvements connected with the charging of storage batteries." F. W. SCHMIDT. October 4th. (Complete.)

22,942. "Improvements relating to variable resistance contact devices." S. G. BROWN. October 4th.

22,954. "Improvements in connection with the employment of electrical heat for metallurgical purposes and in apparatus therefor." W. S. SIMPSON. October 4th.

22,958. "Improved process for separating liquids or solids in solution in liquids by means of fibrous substances and electricity." A. F. SCHREY. October 4th.

22,959. "Improvements in automatic telephone systems." E. NEUHOLD. (Date applied for under Sec. 91 of the Act, September 3rd, 1910, being date of application in Germany.) October 4th. (Complete.)

22,983. "Improved method of operating the brakes of lifting gears driven by electric motors." F. J. MOFFETT and N. B. ROSHER. October 5th.

22,987. "Improvements in under carriages for single-rail vehicles." E. W. C. KEARNEY. October 5th.

22,998. "Improvements in and relating to electrical measuring or electrical indicating instruments." W. H. LAWES. October 5th.

23,006. "Improvements in or appertaining to incandescent electric lamp-holders." R. W. TOWNLEY. October 5th.

23,035. "Improvements in and relating to holders, supports, ears and similar fittings employed in connection with electric conductors, trolley wires and the like." G. W. GREEN. October 5th.

23,044. "Improved means for the electrical transmission of signals." C. ARNOLD. October 5th.

23,049. "Arrangement for indicating the existance of a current in the leads of electrical ignition devices." Firm ROBERT BOSCH. (Date applied for under Sec. 91 of the Act, June 2nd, 1910, being date of application in Germany.) October 5th. (Complete.)

23,065. "New or improved type of cord grip suspension for use in connection with electric light fittings." B. B. H. SUMNER. October 5th.

23,066. "Improvements relating to electric meters." BRITISH THOMSON-HOUSTON Co., LTD., and A. J. MARTIN. October 5th.

23,121. "Improvements in the manufacture of metal-filament lamps." K. SCHROTER. (Date applied for under Sec. 91 of the Act, January 19th, 1910, being date of application in Germany.) October 6th. (Complete.)

23,122. "Method of regulating compensated single-phase alterating commutator motors with shunt excitation." MASCHINENFABRIK OERLIKON. (Date applied for under Sec. 91, of the Act, April 18th, 1910, being date of application in Germany.) October 6th. (Complete.)

23,153. "Improved method of supporting electric cables or wires and means therefor." BULLERS, LTD., and H. DAGNALL. October 6th.

23,222. "Improvements in and relating to incandescent electric lamps." G. LUDECKE and IMPERIAL LAMP WORKS (BRIMSDOWN) LTD. October 7th. (Complete.)

23,295. "Improvements in electrical indicating devices." G. W. CLARKE. October 8th.

23,314. "Means for the control of electric pressure and current regulators." W. J. POOLE. October 8th. (Complete.)

23,332. "Improvements in or relating to the manufacture of incandescent electric lamps." "Z" ELECTRIC LAMP MANUFACTURING Co., LTD., and F. HOGE. October 8th.

23,359. "Improved process of treating aluminium articles for the formation thereupon of galvanic metallic coatings." C. RUMPLER. (Date applied for under Sec. 91 of the Act, October 9th, 1909, being date of application in Germany.) October 8th. (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford ; price, post free, 9d. (in stamps).

1909.

METHODS OF CHARGING AND DISCHARGING ELECTRIC ACCUMULATORS OR SECONDARY BATTERIES. A. M. Taylor. 18,636. August 13th. (Cognate applications, No. 18,783 of 1909, No. 19,609 of 1909, and No. 21,239 of 1909.)

DEVICES FOR AUTOMATICALLY REGULATING THE VOLTAGE OF AND BETWEEN ELECTRICAL MACHINES RUNNING IN PARALLEL. W. J. Walters. 20,869. September 13th.

ARC LAMPS. L. L. D. Cibie. 21,003. September 14th.

SYSTEMS FOR THE DISTRIBUTION OF ELECTRIC ENERGY. W. F. Anderson, S. A. Russell and W. E. Gray. 21,219. September 16th.

SELECTIVE SWITCH SYSTEMS APPLICABLE TO ELECTRIC TRACTION SYSTEMS AND FOR OTHER PURPOSES. British Thomson-Houston Co. (General Electric Co.) 21,903. September 17th.

ELECTRIC TELEGRAPH INSULATORS. J. Ball and C. F. Readman. 22,878. October 7th.

ELECTRIC SWITCHES. H. R. Schultz and F. B. Holt. 25,278. November 2nd.

COUPLING DEVICES FOR ELECTRIC CABLES. W. T. Henley's Telegraph Works Co. and S. H. Penning. 25,449. November 4th.

INTERCOMMUNICATION TELEPHONE SYSTEMS. G. Burney and Sterling Telephone and Electric Co. 28,951. December 10th.

ELECTRI GENERATING MACHINES. E. M. Fitz. 30,338. December 23th.

1910.

CONTROL OF ALTERNATING ELECTRIC CURRENT INDUCTION MOTORS Allgemeine Elektricitäts Ges. 8,621. April 9th. (Date applied for under International Convention, April 10th, 1909.)

DEVICES FOR PRODUCING OR TRANSMITTING ELECTRIC CURRENT WAVES AND OSCILLATIONS. W. J. Rabinsahn. 9,530. April 20th.

DISINFECTING DEVICE FOR TELEPHONE APPARATUS. R Höfermann. 15,318. June 25th. (Date applied for under International Convention, January 27th, 1909.)

HOLDERS FOR ELECTRIC INCANDESCENT LAMPS. R. F. Russell and E. T. Hutson. 15,933. July 4th.

BRUSHES FOR ELECTRICAL APPARATUS. W. A. Stevens, Ltd., W. A. Stevens and A. T. Lambert. 1,145. January 15th.

ELECTRIC SWITCHES. Adams Manufacturing Co. (Cutler-Hammer Mfg. Co.) 2,743. February 3rd.

ELECTRIC CAB CONTROLLING SYSTEM FOR RAILWAYS. H. P. Patterson. 3,637. February 14th.

ELECTRICAL APPARATUS FOR PERFORATING DESIGNS. B. H. Walin. 3,825. February 15th.

DYNAMO ELECTRIC MACHINES. R Fany. 4,907. February 25th. (Date applied for under International Convention, March 1st, 1909.)

ANTI-VIBRATORS FOR GAS-BURNERS OR ELECTRIC LAMPS. H. W. Hanwell. 5,384. March 3rd.

ELECTRIC CIRCUIT CONTROLLING DEVICES. P. A. Newton. (R. Kelly.) 7,276. March 23rd.

DEVICE FOR SENDING CURRENT IMPULSES, PARTICULARLY APPLICABLE TO AUTOMATIC TELEPHONE SYSTEMS. Deutsche Telephonwerke Ges. 7,851 March 31st. (Date applied for under International Convention, November 8th, 1909.)

VARIOMETERS FOR ELECTRICAL OSCILLATIONS. W. P. Thompson. (G. G. von Arco, Germany, and R. H. Rendahl, Sweden.) 8,018. April 5th.

ARMATURE WINDINGS FOR DYNAMO-ELECTRIC MACHINES. Siemens Bros. Dynamo Works. (Siemens-Schuckertwerke Ges.) 8,410. April 7th.

AUTOMATIC TELEPHONES. F. H. Lee. 10,162. April 26th.

POLYPHASE ELECTRIC SERIES MOTORS. Siemens Bros. Dynamo Works. (Siemens-Schuckertwerke Ges.) 10,172. April 26th.

ALTERNATING-CURRENT DYNAMO-ELECTRIC MACHINES OF THE COMMUTATOR TYPE. Allgemeine Elektricitäts Ges. 10,692. April 30th. (Date applied for under International Convention, May 1st, 1909.)

ELECTROMAGNETIC CLUTCHES. E. C. H. T. Lugard. 12,259. May 18th.

RECEIVING AND REGISTERING APPLIANCES FOR ELECTRIC SIGNALS. Siemens and Halske Akt.-Ges. 13,985. June 8th. (Date applied for under International Convention, August 26th, 1909.)